Impact of Sault Ste. Marie East End Wastewater Treatment Plant Discharge on Lake George Channel (St. Marys River) Waters

April 2000



Ministry of the Environment

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EXECUTIVE SUMMARY

This report provides a summary and assessment of data obtained during the 1989 Ontario Ministry of the Environment Sault Ste. Marie East End Wastewater Treatment Plant (WWTP) evaluation surveys. It includes a discussion and interpretation of the WWTP discharge and its impact on Lake George Channel receiving waters. Data included in this document cover the plant final effluent and river water quality monitoring conducted during the June and August surveys. Also included is flow, river current and plume tracking data, as well as bacterial densities and contaminant concentrations in surficial sediment samples collected during the second survey. Major findings and conclusions include:

- (i) The discharge area for the WWTP is on a shallow shelf of less than 2 m depth, where currents are quite variable but typically less than 10 cm.sec⁻¹, with variable direction of flow. Because of the shallowness, flow in the discharge area is more susceptible to influence by wind than the deeper, faster flowing waters of the main channel. For example, under northeast wind conditions, the direction of travel of drogues was initially perpendicular to shore, progressing to about 45 degrees relative to the shore for the first 200 m of travel. This can cause the WWTP discharge plume to impinge on U.S. waters (i.e., result in trans-boundary pollution).
- (ii) The impact of the WWTP discharge on Lake George Channel water quality did not differ appreciably from earlier studies. During the six days of sampling during the two surveys, the East End WWTP design capacity was exceeded once, during a period of high rainfall on August 22nd. Plant discharge loadings were greatest for all measured parameters (suspended solids, chloride, bacteria (faecal coliforms, *Escherichia coli*, *Pseudomonas aeruginosa*), ammonium, total Kjeldahl nitrogen, total phosphorus, phenolics, iron and zinc) on August 22nd, due to the high discharge rate and elevated levels in the final effluent. On this day, estimated loadings of faecal coliforms were up to 200 times greater, while suspended solids, ammonia, total Kjeldahl nitrogen, total phosphorus, iron and zinc loadings were up to two times greater than on the day with the lowest loading.

The impact of the WWTP discharge on Lake George Channel water quality was evident from data on faecal coliforms, *E. coli*, *Pseudomonas aeruginosa* conductivity, chloride, ammonia, total Kjeldahl nitrogen, total phosphorus, phenolics, iron and zinc, levels of which increased noticeably downstream of the discharge point during both surveys. The greatest effect on bacteria densities in river water was found on August 22nd and 23rd, during and immediately following the period of heavy rainfall. For example, faecal coliform densities exceeded the PWQO for the protection of recreational users as far as 4.7 km downstream (i.e., at Bell Point). (*E. coli* accounted for 42% to 85% of the fecal coliforms in the final effluent.) Total phosphorus exceeded the PWQO to prevent excessive aquatic plant growth in rivers for a distance of up to 0.9 km downstream of the

discharge point. Phenolics concentrations exceeded the PWQO to prevent tainting of fish at upstream as well as downstream locations, indicating the influence of sources located upriver of the WWTP.

(iii) Surficial sediments collected at 16 locations in Lake George Channel and in Little Lake George were generally very organic or "oozy" in nature, had an oily sheen, and often with a sewage or oily odour. Sediments from up to 2 km downstream of the WWTP discharge contained elevated (above upstream samples) densities of faecal coliform, Escherichia coli and faecal Streptococcus bacteria. Densities of these organisms reached as high as about 134,000, 14,400 and 21,000 organisms per kg of wet sediment. Concentrations of nutrients and persistent inorganic contaminants (e.g., heavy metals) usually increased downstream of the WWTP discharge, and concentrations were often higher at inshore stations than at offshore stations. Statistical analysis indicated that concentrations of arsenic, cyanide, heavy metals and many of the individual PAH compounds correlated significantly with one another, suggesting a common source. Concentrations of many of the contaminants in Lake George Channel and Little Lake George sediments, as well as at the upstream reference (i.e, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, total PAHs and of 11 individual PAHs), exceeded the Lowest Effect Level Provincial Sediment Quality Guidelines for the protection of benthic organisms. This indicates that upstream sources contribute or have contributed to sediment quality problems in the Lake George Channel and in Little Lake George. In addition, concentrations of available cyanide at some stations exceeded the Provincial guideline for Open Water Dredged Material Disposal. Iron also exceeded the Provincial "Severe Effect Level" (SEL) sediment quality guideline at some stations. Total phosphorus only exceeded the PSQG-LEL at some stations downstream of the WWTP, but total Kjeldahl nitrogen exceed the PSQG-LEL on all but one transect.

Concentrations of solvent extractables exceeded the Provincial Open Water Dredged Material Disposal Guideline of 1,500 mg.kg⁻¹ at stations on downstream transects, as well as at the upstream reference stations, which had the highest concentration. This suggests a dominating influence from upstream sources.

A draft version of this document was provided to the Sault Ste. Marie District office staff and St. Marys River Remedial Action Plan coordinator in September, 1995

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1.0 INTRODUCTION AND BACKGROUND

1.1 Status of Sault Ste. Marie East End WWTP

The Sault Ste. Marie East End Wastewater Treatment Plant (WWTP) is a primary municipal facility with a design capacity of 54.55 x 10³ m³.day⁻¹ and an average daily flow of 42 x 10³ m³.day⁻¹. The discharge alternates between two adjacent 1.67 metre diameter pipes extending 152 m. from shore (Kleinfeldt, 1987) on a relatively shallow (1 to 2 m. depth) shelf in the Lake George Channel (Fig. 1). Combined with the hydrological characteristics of the area (see Section 1.2), this can lead to poor dispersion of the effluent (Fig. 2).

The WWTP was identified by the Upper Great Lakes Connecting Channels Study as an important point source of several contaminants to the St. Marys River (UGLCCS, 1989). These included: phosphorus, ammonia, chloride, oil and grease, certain metals, volatiles, polycyclic aromatic hydrocarbons, chlorinated phenols, chlorinated benzenes and chlorinated ethers as well as bacteria (OMOE, unpubl. 1986-87 data). In addition, the treatment capacity of the plant was frequently exceeded during periods of heavy rainfall (UGLCCS, 1989).

A major plant expansion, including new sludge handling facilities and phosphorus removal equipment, came on-line in April, 1989. Preliminary bench-scale testing indicated that final effluent suspended solids concentrations would be reduced substantially as a result of the phosphorus removal process. It was also anticipated that this would improve the efficiency of year-round chlorination and hence, significantly reduce bacterial levels in the discharge.

1.2 Water Quality Issues

During three 1986 and 1987 Ontario Ministry of the Environment (OMOE) MISA pilot site surveys, bacterial densities were elevated downstream of the East End WWTP outfall. The geometric mean fecal coliform density exceeded the Provincial Water Quality Objective (PWQO) for body contact recreation of 100 organisms.dl⁻¹ (UGLCCS,1988) as far away as Bell Point, about 5 km. downstream. During the same surveys, total phosphorus and ammonia concentrations also increased downstream of the WWTP outfall (e.g., Fig. 3). Similar results were observed in a 1988 survey conducted by the Ministry's Northeastern Region: elevated levels of turbidity, suspended solids and phosphorus were found up to 1 km downstream, and fecal coliform densities were above the PWQO for at least 3 km downstream of the discharge (Smith, 1988).

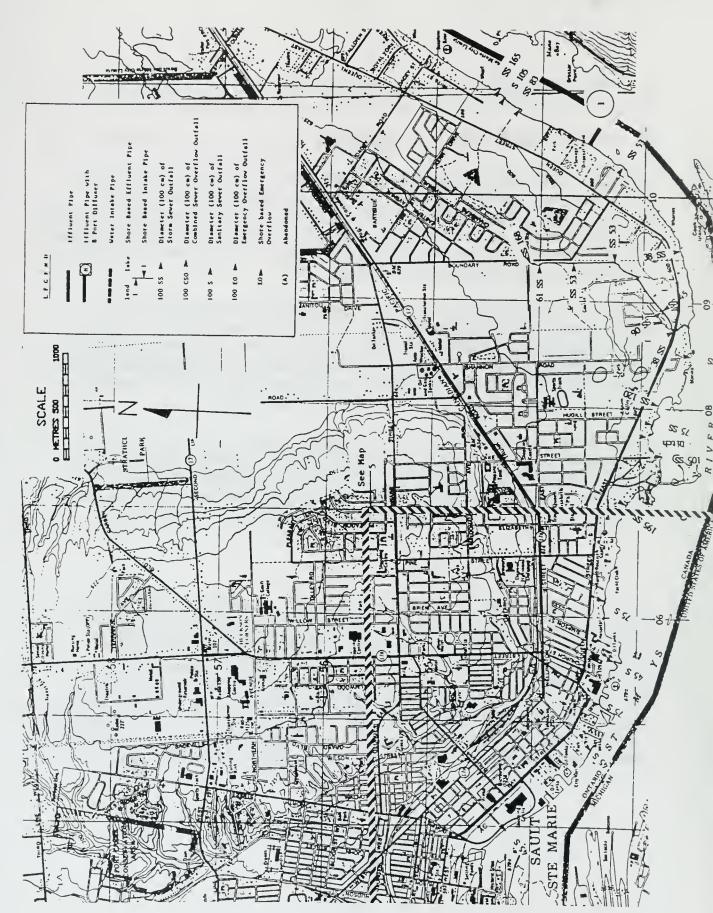


Figure 1. Location of Sault Ste. Marie, Ontario East End WWTP and sewer discharges. (from Kleinfeldt, 1987)



Figure 2. Aerial view of the Sault Ste. Marie East End WWTP discharge plume, June 15, 1984. (Source: Ontario Ministry of Natural Res., Ontario Centre for Remote Sensing).

Previous studies suggest that Canadian and American waters do not mix to an appreciable degree in the upper river or in the main channel above Sugar Island. Nevertheless, some transverse mixing does occur in the Lake George Channel due to the curving nature of the channel. This creates a zone of high velocity towards the Sugar Island (U.S.) shoreline and can lead to transboundary pollution, both from upstream sources as well as from the East End WWTP discharge (UGLCCS, 1989). For example, a 20% increase in ammonia concentrations was detected in U.S. waters of the channel downstream of the WWTP outfall in 1981 (Hamdy & LaHaye, 1983). Transboundary pollution was also detected during 1988 for turbidity, suspended solids, phosphorus and bacteria at distances of from 0.5 km to 3 km downstream of the outfall (Smith, 1988).

During 1988, complaints were received by the Ministry's Sault Ste. Marie district office from downstream waterfront residents regarding floating scum. In the fall of the same year, the end of an outfall pipe broke loose from its moorings and surfaced.

1.3 Sediment Quality Issues

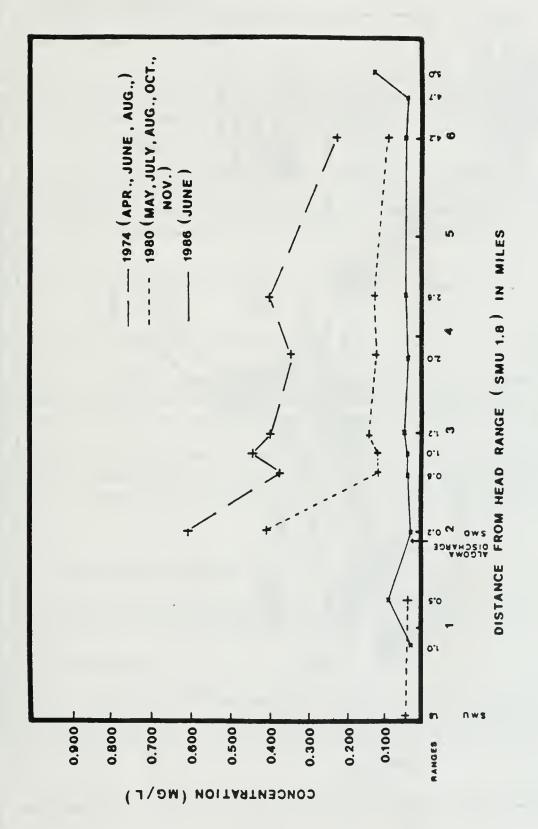
Sediments immediately downstream of the WWTP outfall contain elevated concentrations of contaminants such as heavy metals (e.g., zinc, iron), solvent extractables and polycyclic aromatic hydrocarbons (Kauss, 1986, 1991). In 1985, the benthic macroinvertebrate community in this area was severely to moderately impaired, with an additional zone of moderate impairment extending downstream into Little Lake George as well as upper Lake George (Burt *et al.*, 1988; Fig. 4).

2.0 STUDY OBJECTIVES

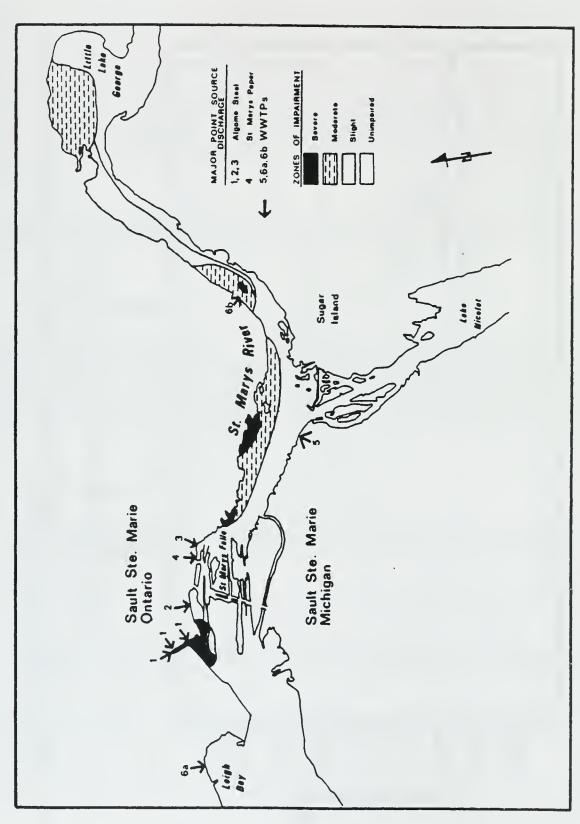
- (i) To determine the current (i.e., post-expansion) impact of the Sault Ste. Marie, Ontario East End WWTP discharge on St. Marys River water and sediment quality in relation to previous years.
- (ii) To determine the variability of the zone of impact of the WWTP discharge plume.
- (iii) To obtain data for the present outfall location (velocities, dispersion coefficients, chemistry) that will aid in modelling and design for a new outfall location/configuration and/or WWTP upgrading.

3.0 FIELD METHODS

Sampling was confined to two periods during 1989: June 27 - July 1 and August 20-24.



Ammonia distribution and yearly trends (1974, 1980 and 1986) along the Sault Ste. Marie, Ontario shoreline. (Source: OMOE data, in UGLCCS, 1989). Figure 3.



Distribution and zones of impairment of benthic macroinvertebrate communities in the St. Marys River, 1985. (Source: UGLCCS, 1989, after Burt et al., 1988). Figure 4.

3.1 Physical Measurements

3.1.1 River Current Measurements

River current velocity and direction were measured (usually on the same day as chemistry) at 100 m intervals, starting at 100 m from the Canadian shore, along transects B, D, E, F, G and H (see Fig. 5). Data were collected using Anderaa Model RCM4S recording meters operated from the survey vessel, which was double-anchored (bow and stern).

At shallow stations (i.e., less than 2 m water depth) measurements were obtained at mid-depth only. Stations deeper than 2 m were measured at approximately 0.2 and 0.8 of total water depth. Stations were measured during six different days (three days during each of the two surveys). The period of current measurement was 10 minutes at each station/depth, with readings every 30 seconds.

Temperature and conductivity profiles were also obtained at each station.

3.1.2 Effluent Discharge Rate and Plume Tracking

During the period of river water quality sampling, discharge flow rate and temperature data were obtained for the WWTP final effluent. These measurements were made three times on each of the six survey days and were coincident with effluent chemistry sampling (see Section 3.2.1).

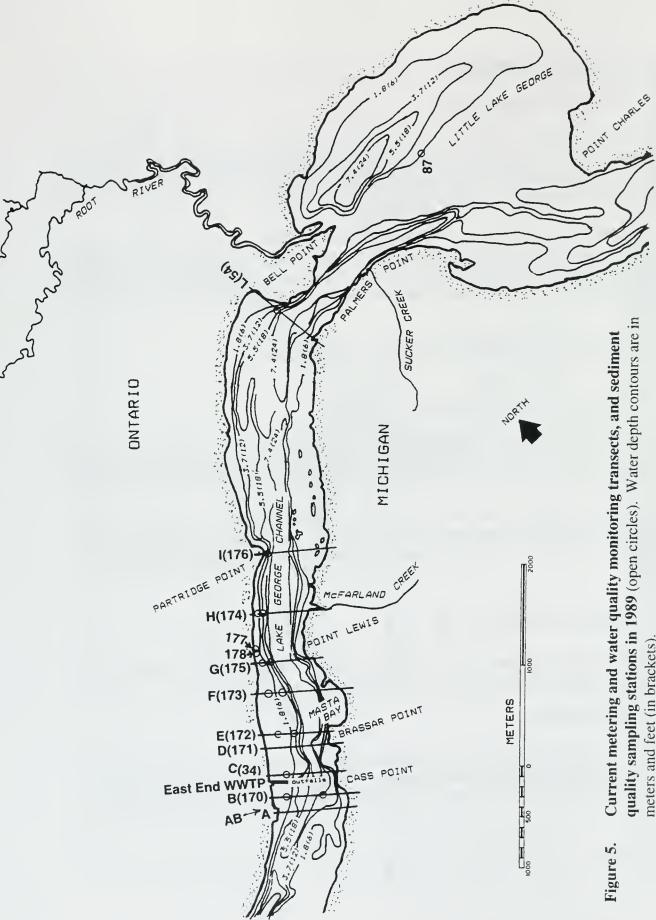
In addition to current measurements, the direction of the effluent plume was determined at the beginning of each survey day to aid in optimization of the river water sampling stations. Two drogues were released at the outfall discharge at mid-depth and tracked for a minimum of 30 minutes.

3.2 Effluent and River Sampling

Grab river water and effluent samples were collected on each survey day, using the appropriate bottles or containers and sample preservation techniques (OMOE, 1989).

3.2.1 Effluent Quality

Three grab samples of the WWTP final (treated) effluent were obtained during each of the six survey days using a pole sampler which held the bottles upright. Sampling was designed to coincide with the period of river water quality sampling (usually between 09:00 and 16:00 hours).



quality sampling stations in 1989 (open circles). Water depth contours are in meters and feet (in brackets).

3.2.2 River Water Quality

The 37 river water quality sampling stations were located along seven transects shown in Figure 5: B, C, D, E, F, H and L (Stations 170, 34, 171, 172, 173, 174 and 54, respectively). These were not always coincident with the current metering stations, the final locations being decided upon in the field each day, based on the results of effluent drogue tracking (see Section 3.1.2). Station descriptions are provided in Appendix Table A-1.

Grab river water samples were pumped from the desired depth using a March Model 5C MD submersible pump attached to a Teflon® -lined hose system that was cleaned before each day's sampling. Additionally, the system was flushed with sample water from each station/depth prior to taking the sample. Except for those bottles already containing preservatives, sample containers were first rinsed twice with sample water before keeping the sample.

At stations of less than 2 metres depth, a single sample was collected at mid-depth. With the exception of stations noted in Appendix Table A-1, two samples were collected at the deeper stations, one each at 0.2 and 0.8 of water depth.

Duplicate samples were also collected at three selected station depths on each of the six sampling days to provide data on within-station variability.

3.2.3 Surficial Sediment Quality

During the second survey, on August 20-22, surficial sediments were collected at 16 stations located mainly in Ontario waters of the Lake George Channel and in Little Lake George (see Fig. 5 and Appendix Table A-1).

A clean, sterilized* Shipek dredge was used to collect three samples at each station. The top 3 cm (central portion) of each of the replicates was removed with a sterilized* spoon and then all were composited and homogenized in a clean, sterilized* stainless steel pan.

After a known volume of sediment homogenate had been weighed to obtain the field (wet) weight, the remaining sediment was distributed among the required sample jars/containers and preserved as required (OMOE, 1989). Pre-sterilized (i.e., autoclaved) jars were used for bacterial submissions.

To provide data on within-station variability (e.g., heterogeneity) two additional replicate samples were obtained at two selected stations.

^{*} allowed to soak in alcohol between stations.

3.3 Field Quality Assurance

3.3.1 Effluent

Once during each of the two surveys, a split sample randomly selected from all nine possible samples/times, was submitted for all chemical and bacteriological tests to provide data on sample handling, preservation and transport, and on laboratory reproducibility.

3.3.2 River Water

During each of the six survey days, three split samples, randomly selected from all 37 possible stations/depths, were submitted for all chemical and bacteriological analyses. In addition, one "field blank" was obtained each day by pouring distilled water through the pump-hose sampling system and submitted for chemical analyses (not bacterial) only, to provide information on potential station-to-station cross-contamination.

Finally, for each of the two surveys, one distilled water "travel-blank" was obtained by filling the required bottles for chemical analyses at the Etobicoke laboratory and transporting them to the field and back to obtain information on potential background (container) contributions to observed measurements.

3.3.3 Surficial Sediment

At two stations randomly selected from the 14 sampled, enough sediment was collected to permit the submission of blind duplicate (split) samples for all analyses.

4.0 ANALYTICAL METHODS

All effluent, river water and sediment samples were submitted to the Ministry's Etobicoke Laboratory Services Branch and analyzed according to documented procedures (OMOE, 1983 and updates) for the parameters listed in Appendix A, Tables A-2 and A-3. Analytical methods and measurement capabilities are also included in the tables.

Analytical parameter selection was based on those effluent contaminants with the highest above-background (river) concentrations during the 1986/87 MISA pilot study surveys (Appendix Table A-2). Parameter selection was similar for sediments, with the additional objective of filling data gaps for certain contaminants (e.g., bacteria, arsenic, cyanide and polycyclic aromatic hydrocarbons).

5.0 RESULTS AND DISCUSSION

5.1 Physical Measurements

5.1.1 WWTP Discharge Rate

Data on water temperature and flow rate of the East End WWTP final effluent are provided in Table 1. It is noteworthy that the peak flow rate of 60,000 m³.d⁻¹ was recorded during mid-day of August 22. A total 11.2 mm of rainfall was recorded at the Sault Ste. Marie, Ontario airport on this day (Appendix Table A-4).

5.1.2 River Water Temperature and Currents

Depth profile data on water temperature in the Lake George Channel are listed in Tables 2 and 4. These do not indicate any pronounced thermal stratification of the receiving waters during the two surveys.

Over the two survey periods, river current velocities were measured at a total of 26 stations. At 14 of these stations, velocities were measured at two different depths, (using two Anderaa RCM4S meters).

A basic statistical summary (i.e., mean, standard deviation, minimum and maximum) of the measured current velocities is provided in Table 2. This includes the results of measurements made during June 28-29, June 30, July 1, August 22, August 23 and August 24, respectively.

In Table 2, the "current heading" is the bearing angle between the current direction and the "Magnetic North" direction. This angle is positive if it is measured clockwise from North, and negative if it is measured counter-clockwise from North. During 1989, in the St. Marys River area, the "Magnetic North" direction was about seven degrees towards the West of "True (geographic) North". As examples of how the above applies to Table 2: a "current heading" of 128, -38, +52 and +142 degrees, means that the current is flowing towards the geographic SW, NW, NE and SE direction, respectively.

5.1.3 Plume Tracking

Although two drogues were released very near to the outfall location on each of the six days, some difficulties were experienced due to the shallow water conditions in the vicinity of the outfall. As a result, only nine of the 12 total releases provided useful plume tracking information.

The travel paths taken by the nine drogues are indicated in Figures 6 and 7. These Figures summarize results obtained during the six measurement days: June 27, June 28, June 29, August 22, August 23 and August 24, respectively.

Table 1. East End WWTP final effluent flow rate and quality.

Zinc	ug.l.	31	40	32	34	20	34	30	37	09	46	43	46	21	36	62	36	24	21	16	20	7.4	25	22	24	32
Iron	µg.14	1200	920	710	922	1200	830	800	927	850	:	089	092	770	1200	1200	1035	880	0001	790	988	770	730	720	740	872
Phenolics	μg.]-1	41.0	41.0	47.0	42.9	48.0	45.0	580	49.9	51.0	51.0	44.8	48.8	37.6	:	49.6	43.2	46.0	45.6	42.4	44.6	43.8	37.4	36.3	39.0	44.6
Phosphorus Phenolics	mg.l ⁻¹	0.60	99.0	0.64	0.63	0.84	0.84	16.0	98 0	1.02	0.80	0.64	08.0	0.78	e 	2.42	1.3	0.85	0.75	0.65	0.75	06 0	0.76	09.0	0.74	0.83
ii .	mg.l ⁻¹	18.00	18.20	23.10	19.63	19 70	20.90	25.20	21.81	21.40	19.80	20.40	20.52	23.60	31.80	30.50	28.39	24.90	24 50	24.70	24.70	23.90	22.30	22.55	22.91	22.82
Ammonium	mg.1 ¹	15.50	15.70	20.02	17.00	17.10	17.80	21.80	18 79	16.40	16.20	17.20	16.59	19.80	24.90	22.40	22.27	19.70	20.00	19.10	19.60	18.80	18.20	18.40	18 46	18.70
Pseudomonas	number dl	1480	<20	-33	-79	300	~117	~328	-226	~30	4600	2900	-737	880	3300	7600	2805	220	099	460	406	~20	320	220	-112	~345
Escherichia	number di'	52000	1700	33000	14289	41000	4000	3600	8939	920	55000	0006	7694	ŧ	;	;	:	;	1	:	:	1000	2600	1550	1591	6288
Fecal	number.dl 1	75000	2300	50000	20508	77000	5300	0009	13516	2200	132000	13000	15571	72000	570000	1040000	349473	4700	35000	5500	10517	1400	4300	2000	2292	18201
Chloride	mg.l ⁻¹	87.40	91.20	90.80	89.80	87.30	92.10	88.30	89,20	86.10	88.60	90.20	88.28	75.20	71.50	66.50	70.98	68.00	72.20	74.10	71.39	67.50	71.00	65.50	96.79	79.02
Conductivity	µmho cm	730.0	729.0	752 0	737.0	738.0	751.0	766.0	752.0	736.0	732.0	700.0	722.0	638.0	0'699	653.0	653.0	638.0	643.0	643.0	641.3	636.0	633.0	623.0	630.6	687.6
Suspended	mg 1	21.0	20.7	19.0	20.2	20.3	19.2	21.3	20.2	29.6	21.4	18.2	22.6	21.1	32.0	45.3	31.3	24.6	31.7	26.2	27.3	31.5	25.3	18.8	24.6	24.1
Turbidity	FTU	11.30	9.20	5.70	8.40	10.10	9.90	11.40	10.40	13 40	10.30	9.50	10.94	8.90	13.50	19.00	13.17	9.00	9.00	10.90	9.59	15.20	10.40	8.80	11.16	10.51
Hd	-log ₁₀ [H*]	7.46	7.92	8.01	7.85	7.87	7.92	7.92	7.90	7.48	7.52	7.37	7.46	7.16	7.16	7.15	7.16	7.10	7.02	7.51	7.27	7.25	7 25	7.47	7.34	7.59
Temperatur	, c	16.0	16.5	16.5	16.3	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	20.0	20.0	20.0	20.0	20:0	20.0	20.0	20.0	20:0	20.0	20.0	20.0	17.9
Discharge	10 ³ m ³ day ³	38.5	40.0	40.0	39.5	38.0	30.0	30.0	32.5	370	30.0	31.0	32.5	36.0	0.09	48.0	47.0	30.0	37.0	37.0	34.5	30.0	35.0	37.0	33.9	36.3
Sampling time	Date Time	June 27 10:25	11:25	" 12:35	" mean	June 28	:	1	mean	June 29 09:30	10:30	11:30	" теап	Aug. 22 11:00	12:30	14:00	" mean	Aug. 23 09:00	00:01 ,,	" 11:00	" mean	Aug. 24 09:00	10:00	11:00	" mean	Study Mean

NOTES:

"mean" =

geometric (log₁₀) mean information or data not available (e.g., sample spoiled in laboratory accident). less than.

~ = approximately.
Underlined values in shaded cells, if monthly averages, would exceed the GLWQA monthly average objective of 1 mg/l total phosphorus for sewage treatment plants (IJC, 1988)
Bolded discharge rate exceeds the design capacity.

Summary of Lake George Channel current meter and temperature measurements. Table 2.

OS 23 94 OR4 93 94 419 4593 374 Into an initial mass. mice and antital mass. <th< th=""><th></th><th>F</th><th>Distance from CDM</th><th>Motor Donth m</th><th>Number of</th><th></th><th>Temper</th><th>Temperature °C</th><th></th><th></th><th>Current Head</th><th>Current Heading, degrees</th><th></th><th></th><th>Current Speed, cm.s.</th><th>eed, cm.s.</th><th></th></th<>		F	Distance from CDM	Motor Donth m	Number of		Temper	Temperature °C			Current Head	Current Heading, degrees			Current Speed, cm.s.	eed, cm.s.	
B(170) 100 055 3.1 0.4 0.4 9.4 0.4<	Date	(Station)		Merci Depui, in	Readings	mean	s.d.	min	max.		s.d.	min.	-{	теап	s.d	min.	max
E(172) 200 115 350 900 91 955 956 353 956 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 856 354 456 354 456 354 456 354 456 354 456 354 456 354 456 354 456 354 456 354 456 354 457 354 456 354 457 456 357 354 457 456 357 354 457 456 357 354 457 456 357 354 457 456 357 354 457 456 357 354 457 456 457 456 357 357 </th <td>fune 28</td> <td>B (170)</td> <td>100</td> <td>0.5</td> <td>23</td> <td>9.4</td> <td>0 04</td> <td>9.3</td> <td>9.4</td> <td>41.9</td> <td>45.93</td> <td>57.7</td> <td>110.4</td> <td>3.7</td> <td>3.26</td> <td>1.5</td> <td>12.7</td>	fune 28	B (170)	100	0.5	23	9.4	0 04	9.3	9.4	41.9	45.93	57.7	110.4	3.7	3.26	1.5	12.7
Fig. 3 90 0.04 8.9 9.0 55.3 3.00 61.6 8.9 9.0 55.3 3.0 61.6 8.9 9.0 55.3 3.0 61.6 8.9 9.0 55.3 3.0 61.6 8.9 9.0 55.3 9.0 61.6 9.1 60.0 8.9 9.0 65.3 3.0 61.1 7.9 7.0 8.9 9.0 9.0 9.0 9.0 9.0 9.0 9.0 9.0	2	3	200	1.5	30	0.6	0.05	0.6	1.6	59.2	9.50	28.4	92.8	28.6	5.32	12.7	40.7
E(172) 100 45 23 90 666 834 476 613 464 239 e. 40 45 23 90 600 89 91 666 834 476 811 205 313 323 464 239 e. 40 45 26 80 91 66 834 476 811 205 313 313 153 e. 70 10 10 10 91 00 91 667 834 476 811 20 313 153 464 20 313 413 414 415 314 416 219 416 810	2	:	300	1.0	25	0.6	0.04	8.9	0.6	55.3	3.09	50.4	63.6	51.2	1.86	46.3	51.9
E(172) 100 15 25 90 0.01 89 91 662 8.84 475 860 132,4 400 21 662 8.84 475 870 132,4 400 23 90 0.01 91 660 8.84 475 873 873 32,4 400 23 23 23 32,4 400 23 20 20 91 60 91 60 884 475 873 873 32,4 33 13 13 13 873 33 33 13 13 13 13 13 13 13 13 13 13 13 14 16 16 10 <	2	:	÷	4.5	24	6.8	0 03	8.9	0.6	9.95	3.95	50.0	1.99	40.2	4.64	29.5	46.3
E(172)	*	:	400	1.5	25	0.6	0 03	6.8	1.6	68.2	8.59	47.2	0.98	32.4	4.00	23.9	40.7
E(17) F(18) F(18	:	:	:	4.5	25	0.6	0.03	0.6	9.1	0.69	8,84	47.6	81.1	29.5	3.23	23.9	35.1
E(172) 100 0.5 17 100 0.5 17 100 17 17 170 170 170 170 170 1887 177 170 <td>:</td> <td>:</td> <td>200</td> <td>1.0</td> <td>18</td> <td>9.4</td> <td>0.00</td> <td>9.4</td> <td>9.4</td> <td>57.1</td> <td>17.93</td> <td>24.9</td> <td>83.9</td> <td>8.7</td> <td>5.97</td> <td>1.5</td> <td>18.3</td>	:	:	200	1.0	18	9.4	0.00	9.4	9.4	57.1	17.93	24.9	83.9	8.7	5.97	1.5	18.3
E(T72) 100 0.5 17 108 0.11 107 110 1681 3777 170 2552 35.8 35.8 35.8 35.8 35.8 35.9 15 15 15 100 <t< th=""><td>*</td><td>:</td><td>7</td><td>2.0</td><td>. 20</td><td>9.4</td><td>0 0 0</td><td>9.4</td><td>9.6</td><td>27.8</td><td>21.80</td><td>-%-</td><td>72.7</td><td>3.2</td><td>3.18</td><td>1.5</td><td>12.7</td></t<>	*	:	7	2.0	. 20	9.4	0 0 0	9.4	9.6	27.8	21.80	-%-	72.7	3.2	3.18	1.5	12.7
E(I72) 100 0.5 17 108 0.11 106 110<														1	4	,	
F(173) 100 1.1 108 0.11 106 109 2067 1041 203 373, 373, 373, 373, 373, 373, 373, 373,	June 28	E (172)	100	0.5	17	8.01	0.11	10.7	11.0	168.7	37.77	120.9	255.2	3.5	3.89	1.5	12.7
Fe(173) 100 10 21 100 0.06 103 110 213 8553 336 336 336 336 336 346 247 347 348 346 348 346 348	=	3	200	:	21	10.8	0.11	10.6	10.9	205.7	104.1	20.3	327.3	7.1	5.29	1.5	
Heat	ž	3	300	1.0	21	10.9	90.0	8.01	11.0	217.3	86.55	33.6	336.9	3.6	3.29	1.5	12.7
F(172) 100 19 9.3 0.66 9.3 9.5 6.46 33.3 5.2 5.29 3.46 23.9 " 500 20 26 9.4 10.1 6.46 33.3 5.27 5.29 3.46 23.9 " " 8.0 18 9.4 10.1 12.0 13.0 12.0 12.0 14.3 5.9 3.46 23.9 " 2.0 1	Ξ	=	400	3.0	24	9.4	0.04	9.3	9.5	49.8	2.58	42.3	54.5	47.7	2.47	46.3	51.9
F(173) 100 0.5 18 0.18 9.4 10.1 39.0 8.31 20.3 52.5 31.2 52.4 29.5 F(173) 100 0.5 18 9.5 0.05 9.4 10.1 11.2 12.5 14.5 14.3 6.5 21.1 9.18 1.5 F(173) 100 0.5 2.1 11.2 12.5 14.5 14.5 6.2 21.1 9.18 1.5 1.5 " 3.0 " 19 10.8 0.41 10.4 11.8 21.2 35.7 20.9 31.6 1.5 1	3	:	=	10.0	19	6.3	90 0	9.3	9.5	42.7	6.46	33.3	55.2	29.8	3.46	23.9	35.1
E(173) 100 0.5 0.4 9.5 4.2 4.2 4.2 14.0 6.2 21.1 9.18 1.5 E(173) 100 0.5 2.1 11.2 12.5 42.3 4.40 6.2 21.1 9.18 1.5 e (173) 100 0.5 2.1 10.4 10.4 11.2 12.5 44.03 5.47 20.9 21.1 9.18 1.5	:	:	200	2.0	26	8.6	0.18	9.4	10.1	39.0	8.31	20.3	52.5	33.2	5.24	29.5	46.3
F(173) 100 0.5 21 11.7 0.30 11.2 12.5 61.8 74.03 54.7 209.5 20 167 1.5 " 300 " 19 9.8 0.41 10.4 11.8 21.7 290 33.6 8.6 3.12 1.5 " 300 " 19 9.8 0.03 9.8 10.4 14.37 290 33.6 8.6 3.12 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.4 14.37 290 3.6 1.5	:	;	ē	8.0	81	9.5	0.05	9.4	9.5	42.3	14.26	14.1	62.9	21.1	9.18	1.5	29.5
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$																	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	June 29	F(173)	100	0.5	21	11.7	0.30	11.2	12.5	8.19	74.03	-547	209.5	2.0	1.67	1.5	7.1
" 300 " 19 98 0.12 97 102 134 1437 -290 336 86 3.12 15 " " 400 20 97 0.03 97 102 134 1437 -290 336 86 3.12 15 " 400 20 19 9.8 0.03 98 9.9 11.4 19.65 -4.79 36.4 6.4 2.89 3.5 15 2.9 10.2 2.9 11.7 3.9 3.6 4.9 4.4 1 4.4 1.8 3.5 2.3 1.5 3.5 1.5 3.5 2.3 3.5 <t< th=""><td>=</td><td>3</td><td>200</td><td>1.0</td><td>19</td><td>10.8</td><td>0.41</td><td>10.4</td><td>8.11</td><td>21.2</td><td>35.79</td><td>38.1</td><td>73.7</td><td>1.8</td><td>1.28</td><td>1.5</td><td>7.1</td></t<>	=	3	200	1.0	19	10.8	0.41	10.4	8.11	21.2	35.79	38.1	73.7	1.8	1.28	1.5	7.1
a a	7.	:	300	:	61	8.6	0.12	9.7	10.2	13.4	14.37	-29.0	33.6	9.8	3.12	1.5	12.7
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	=	:	z	3.0	20	7.6	0.05	9.7	6.6	11.4	19.65	-17.9	59.1	6.5	2.55	1.5	12.7
a B	3	*	400	2.0	61	8.6	0.03	8.6	6.6	32.6	2.90	24.9	36.4	40.4	1.28	35.1	40.7
" 500 2.0 19 10.1 0.05 10.0 10.2 39.4 6.58 16.5 46.2 23.0 2.08 18.3 " " 7.0 17 9.9 0.04 9.9 10.1 33.5 6.41 23.8 54.9 1.27 1.77 1.77 1.77 1.77 " 3.0 19 9.8 0.03 9.8 9.9 32.3 4.95 25.2 40.9 1.27 1.77 1.77 " 10.0 1.0 2.2 10.2 0.13 10.0	=	:	s	8.0	81	8.6	00.0	8.6	8.6	20.2	5 20	13.7	36.1	28.9	3.75	23.9	35.1
G(175) 100 1.0 22 9.9 0.04 9.9 10.1 33.5 64.1 23.8 54.9 12.7 1.72 7.1 G(175) 100 1.0 22 9.9 0.08 9.8 10.1 33.5 64.1 23.8 54.9 12.7 1.72 7.1 a 200 1.0 22 9.9 0.08 9.8 10.1 10.1 22.4 49.5 25.2 40.9 12.7 1.72 7.1 a 200 1.0 22 10.2 0.13 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 26.3 6.62 14.1 38.8 17.0 24.0 35.1 39.4 24.0 35.1 37.1 37.1 37.1 37.1 37.1 37.1 37.1 37.1 37.1 37.1 37.2 37.2 44.1 31.7 37.2 44.1 31.7 37.9 37.9 H(174)	ž	:	200	2.0	19	10.1	0.05	10.0	10.2	39.4	6.58	16.5	46.2	23.0	2.08	18.3	23.9
G(175) 100 1.0 22 9.9 0.08 9.8 10.1 33.5 6.41 23.8 54.9 12.7 1.72 7.1 " 1.0 1.0 9.8 9.8 9.9 32.3 4.95 25.2 40.9 12.7 1.76 7.1 " 200 " 22 0.13 10.0 10.0 10.0 10.0 26.3 6.62 14.1 38.8 17.0 5.5 7.1 " 11.0 21 10.0 10.0 10.0 10.0 26.3 6.62 14.1 38.8 17.0 5.5 7.1 " 2.0 2.0 10.0 10.0 10.0 26.3 6.62 14.1 38.8 17.0 5.5 7.1 " 9.0 2.0 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 20.4 32.5 4.1.1 38.8 17.0	=	:	=	7.0	17	6.6	0.04	6.6	10.0	34.6	5.15	21.4	1.44	18.0	1.35	12.7	18.3
H(174) 100 10 9.8 9.9 32.3 4.95 25.2 40.9 12.7 1.86 7.1 " 200 " 22 10.2 0.13 10.0 10.5 35.2 2.44 31.5 42.3 39.4 2.40 35.1 " 200 11.0 21 10.0 10.0 10.0 10.0 10.0 10.0 26.3 6.62 14.1 38.8 17.0 5.55 7.1 " 200 2.0 20 10.2 10.2 10.3 18.9 5.60 8.8 29.1 37.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 32.3 33.9 32.9 4.18 32.9 4.18 32.9 4.18 32.9 4.18 4.18 4.18 4.18 4.18 4.18 4.18 4.18 4.18	PC edul	G (175)	001	0.1	22	6.6	0.08	8.6	10.1	33.5	6.41	23.8	54.9	12.7	1.72	7.1	18.3
u 200 u 22 10.2 0.13 10.0 10.5 10.5 10.0 <td></td> <td>7</td> <td>=</td> <td>3.0</td> <td>. 61</td> <td>8.6</td> <td>0.03</td> <td>8.6</td> <td>6.6</td> <td>32.3</td> <td>4.95</td> <td>25.2</td> <td>40.9</td> <td>12.7</td> <td>1.86</td> <td>7.1</td> <td>18.3</td>		7	=	3.0	. 61	8.6	0.03	8.6	6.6	32.3	4.95	25.2	40.9	12.7	1.86	7.1	18.3
H(174) H	3	s	200	z	22	10.2	0.13	10.0	10.5	35.2	2.44	31.5	42.3	39.4	2.40	35.1	40.7
H(174) 100 1.0 20 10.1 0.06 10.1 10.4 39.4 2.35 32.6 44.1 31.7 3.61 23.9 29.5 10.1 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.1 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.3 10.2 10.3 10.3 10.2 10.3 10.3 10.3 10.3 10.3 10.3 10.3 10.3	:	:	3	11.0	21	10.0	0.00	0.01	10.0	26.3	6.62	14 1	38.8	17.0	5.55	7.1	23.9
H (174) 100	:	:	300	2.0	20	10.3	0.05	10.2	10.3	18.9	2.60	œ, œ,	29.1	32.3	3.38	29.5	40.7
H (174) 100 1.0 25 10.1 0.06 10.1 10.4 39.4 2.35 32.6 44.1 31.7 3.61 23.9 23.9 2.00 2.5 23 10.1 0.03 10.1 10.2 38.9 3.3.2 32.2 44.8 27.9 3.03 23.9 23.9 2.00 2.5 2.3 10.2 0.05 10.2 10.3 49.1 2.45 44.1 53.5 33.2 2.72 29.5 29.5 20 2.2 10.4 0.11 10.2 10.6 9.7 24.05 40.2 38.5 5.8 2.95 1.5 1.5 1.0 20 10.0 0.07 9.9 10.1 -6.0 24.37 48.9 32.2 6.8 2.19 1.5 1.5 1.5 1.0 20 10.8 0.12 10.5 11.0 11.5 11.5	:	s	٤	8.0	21	10.1	0.10	6.6	10.2	51.9	0.43	50.7	52.5	8.2	4.18	1.5	18.3
" 40 25 10.1 0.03 10.1 10.2 33.2 33.2 33.2 44.8 27.9 3.03 23.9 " 200 2.5 23 10.2 0.05 10.2 10.3 10.2 10.3 49.1 2.45 44.1 53.5 33.2 27.2 29.5 " 9.5 2.2 10.2 0.05 10.1 10.2 10.2 47.7 47.8 43.7 64.3 16.0 3.71 7.1 " 300 2.0 2.0 10.1 10.2 10.6 9.7 24.05 40.2 38.5 5.8 2.95 1.5 " 7.0 20 10.0 0.07 9.9 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 400 1.0 20 10.5 10.5 11.0 -59.9 78.90 -206. 82.8 2.19 1.5 1.5	fune 29	H (174)	001	1.0	25	10.1	90:0	10.1	10.4	39.4	2,35	32.6	44.1	31.7	3.61	23.9	35.1
" 200 2.5 2.3 10.2 0.05 10.2 10.3 10.2 10.3 49.1 2.45 44.1 53.5 33.2 2.72 29.5 " 9.5 2.2 10.2 0.05 10.1 10.2 52.7 4.78 43.7 64.3 16.0 3.71 7.1 " 300 2.0 2.2 10.4 0.11 10.2 10.6 9.7 24.05 40.2 38.5 5.8 2.95 1.5 " 7.0 20 10.0 0.07 9.9 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 400 10 20 10.1 10.5 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 400 10 20 10.5 10.5 10.0 -59.9 78.90 -206. 82.8 2.1 1.71 1.5	5		2	4.0	25	10.1	0.03	10.1	10.2	38.9	3.32	32.2	44.8	27.9	3.03	23.9	35.1
" 9,5 22 10,2 0.05 10,1 10,2 52.7 4,78 43.7 64.3 16.0 3.71 7.1 " 300 2.0 22 10,4 0.11 10.2 10.6 9.7 24.05 -40.2 38.5 5.8 2.95 1.5 " 7.0 20 10,0 0.07 9.9 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 400 10 20 10.5 10.5 11.0 -59.9 78.90 -206. 82.8 2.1 1.71 1.5	3	:	200	2.5	23	10.2	0.05	10.2	10.3	49.1	2.45	44.1	53.5	33.2	2.72	29.5	35.1
" 300 2.0 22 10.4 0.11 10.2 10.6 9.7 24.05 -40.2 38.5 5.8 2.95 1.5 " " 7.0 20 10.0 0.07 9.9 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 4.00 1.0 20 10.1 10.5 11.0 -59.9 78.90 -206. 82.8 2.1 1.71 1.5	3	3	Ξ	9.5	22	10.2	0.05	10.1	10.2	52.7	4.78	43.7	64.3	16.0	3.71	7.1	23.9
" 7.0 20 10.0 0.07 9.9 10.1 -6.0 24.37 -48.9 32.2 6.8 2.19 1.5 " 400 1.0 20 10.8 0.12 10.5 11.0 -59.9 78.90 -206, 82.8 2.1 1.71 1.5	3	2	300	2.0	22	10.4	0 11	10.2	10.6	6.7	24.05	-40.2	38.5	5.8	2.95	1.5	12.7
10 20 10.8 0.12 10.5 11.0 -59.9 78.90 -206, 82.8 2.1 1.71 1.5	=	3	=	7.0	20	10.0	0.07	6.6	10.1	0.9-	24.37	-48.9	32.2	8.9	2.19	1.5	12.7
	69	*	400	0.1	20	10.8	0.12	10.5	11.0	-59.9	78.90	-206.	82.8	2.1	1.71	1.5	7.1

Table 2. continued.

June 30 B (170) LOS 27 9.8 June 30 B (170) 100 0.5 27 9.8 June 30 B (170) 100 0.5 1.0 9.4 9.6 June 30 E (172) 100 0.5 1.0 9.4<	9.8 9.9 9.4 9.4 9.4 9.4 9.4 9.4 9.4 9.4 9.4	s.d. min max. (03 9.8 9.9 9.9 (11) 9.5 10.0 (02 9.4 9.4 (02 9.4 9.4 (03 9.7 9.7 (13 10.6 10.7 (03 9.6 9.9 (04 9.9 (05 10.6 10.1 (05 0.6 9.5 9.6 (08 9.6 9.9 (08 9.6 9.9 (08 9.6 9.9	mean 41.5 67.0 63.3 70.3 68.4 60.1 70.0 37.5 37.5 44.4 54.0 46.8 46.8 46.8 46.8 46.8 47.1 37.1 37.1	8.63. 24.2 1.45 64.3 6.47 84.5 6.47 84.5 3.76 63.6 4.41 55.6 5.11 55.0 8.20 20.3 8.27 47.2 8.20 20.3 8.27 49.0 6.94 32.2 2.57 49.0 6.94 32.2 5.71 34.3 12.00 15.8 21.36 -16.1		max. mean 72.3 13.1 69.6 43.8 80.7 31.2 76.2 57.5 74.1 46.3 72.7 30.3 86.7 17.7 59.8 22.4 41.9 42.2 59.1 42.8 44.3 42.8 59.1 42.8 79.2 42.8 79.2 42.8 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 79.2 <th>s.d. 150 8 2.84 2 2.85 5 2.85 3 3.94 3 2.72 7 2.55 4 4.48 4 4.48 4 4.48 4 2.82 4 3.42 8 5.62</th> <th>min. 12.7 40.7 23.9 51.9 40.7 23.9 12.7 7.1</th> <th>18.3 16.3 46.3 46.3 51.9 35.1 23.9 23.9 23.9 23.9 46.3 46.3 40.7</th>	s.d. 150 8 2.84 2 2.85 5 2.85 3 3.94 3 2.72 7 2.55 4 4.48 4 4.48 4 4.48 4 2.82 4 3.42 8 5.62	min. 12.7 40.7 23.9 51.9 40.7 23.9 12.7 7.1	18.3 16.3 46.3 46.3 51.9 35.1 23.9 23.9 23.9 23.9 46.3 46.3 40.7
B (170) 100 0.5 27 " 200 1.0 18 " 4.0 20 " 4.0 20 " 4.0 20 " 4.0 20 " 4.0 1.0 20 " 500 " 19 " 500 " 19 " 4.0 1.0 19 " 4.0 1.5 19 " 4.0 1.5 19 " 4.0 1.5 19 " 4.0 1.5 19 " 500 2.0 19 " 4.0 1.5 19 " 500 1.0 19 " 300 1.0 10 " 500 1.0 20 " 500 1.0 20 " 500 1.0 20 " 4.0 1.6 20 " 4.0 1.6 20 " 200 2.0 20 " 300 2.0 20 " 300 2.0 20 "	9.8 9.6 9.4 9.4 9.7 10.4 10.6 9.6	9.8 9.5 9.5 9.7 10.2 10.6 9.6 9.5	41.5 67.0 63.3 63.3 66.1 66.1 66.1 66.1 67.0 67.0 67.0 67.0 67.0 67.0 67.0 67.0	8.63 1.45 6.47 6.47 4.41 5.11 8.57 8.20 51.86 2.57 6.94 5.71 12.00 21.36 16.74				12.7 40.7 23.9 51.9 40.7 23.9 12.7 7.1 1.5	18.3 46.3 35.1 63.1 51.9 35.1 23.9 23.9 12.7 12.7 46.3 40.7
E (172) 100 0.5 19 E (172) 100 0.5 19 E (173) 100 0.5 19 F (174) 100 0.5 19 G (175) 100 0.5 19 H (174) 100 1.5 20 H (174) 100 20	9.6 9.4 9.4 9.4 9.7 10.6 10.1	9.5 9.3 9.3 9.7 10.6 10.6 9.6 9.5	67.0 63.3 68.4 60.1 70.0 70.0 37.5 84.4 8.5 8.5 8.5 8.5 8.5 8.5 8.7.1 37.1	1.45 6.47 3.76 4.41 5.11 8.57 8.20 51.86 2.57 6.94 5.71 12.00 21.36 16.74				40.7 23.9 51.9 40.7 23.9 12.7 7.1 1.5	463 463 463 463 463 407 407
E(172) 100 0.5 19 65 20 19 600 1.0 20 20 20 20 20 20 20 20 20 20 20 20 20	9.5 9.4 9.4 9.7 10.6 10.1 9.6	9.5 9.3 9.7 10.2 10.6 10.6 9.6 9.5	63.3 68.4 66.1 60.1 70.0 77.0 84.4 85.4 85.4 87.1 37.1 37.1 37.1 37.1	6.47 4.41 5.11 8.57 8.20 51.86 2.57 6.94 5.71 12.00 21.36 16.74				23.9 51.9 40.7 23.9 12.7 7.1 1.5	35.1 63.1 63.1 23.9 23.9 23.9 12.7 18.3 46.3 40.7
E(172) 100 0.5 19 E(172) 100 0.5 19 E(172) 100 0.5 19 E(173) 100 0.5 19 E(173) 100 0.5 19 E(173) 100 0.5 19 E(1743) 100 0.5 19 E(175) 100 0.5 19 E(175) 100 0.5 19 E(177) 100 0.5 20 E(177) 100 0	9 4 4 9 4 4 9 4 4 9 4 4 9 4 4 9 4 9 4 9	9.4 9.3 10.2 10.6 10.6 9.6 9.5	70.3 68.4 66.1 70.0 77.5 77.1 77.1 77.1 77.1 77.1 77.1 77.1	3.76 4.41 5.11 8.57 8.20 51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				51.9 40.7 23.9 12.7 7.1 1.5	63.1 23.9 23.9 23.9 12.7 18.3 46.3 40.7
E (172) 100 0.5 19 E (173) 100 0.5 19 E (173) 100 0.5 19 E (173) 100 0.5 19 E (174) 100 0.5 19 E (175) 100 0.5 19 E (174) 100 0.5 19 E (175) 100 0.5 19 E (174) 100 0.5 19 E (175) 100 0.5 19 E (174) 100 0.5 19 E (175) 100 0.5 20 E (175	9.4 9.4 9.7 10.4 10.6 10.1 9.6	9.3 9.4 10.2 10.6 10.6 9.6 9.5	68.4 60.1 70.0 37.5 44.4 54.0 54.0 46.8 37.1 37.1 37.1 37.1	4.41 8.51 8.20 8.20 51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				40.7 23.9 12.7 7.1 1.5	51.9 35.1 23.9 23.9 12.7 18.3 46.3 40.7 51.9
E (172) 100 0.5 19 19 19 100 100 110 200 110 110 110 110 110 110	9.4 9.7 10.4 10.6 10.1 9.6 9.5	9.4 9.7 10.2 10.6 10.6 9.6 9.5	60.1 70.0 37.5 37.5 44.4 54.0 46.8 46.8 37.1 37.1 37.1 37.1	5.11 8.57 8.20 51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				23.9 12.7 7.1 1.5	35.1 23.9 23.9 12.7 18.3 46.3 40.7 51.9
E (172) 100 0.5 19 19 19 19 19 19 19 19 19 19 19 19 19	9.7 10.4 10.6 10.1 9.6 9.5	9.7 10.2 10.6 10.6 9.6 9.5	70.0 37.5 31.6 44.4 54.0 46.8 37.1 37.1 37.1 37.1	8.57 8.20 51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				12.7 7.1 1.5 7.1	23.9 23.9 12.7 18.3 46.3 40.7 40.7
E(172) 100 0.5 19 " 300 1.0 18 " 300 1.0 19 " 4.0 20 " 4.0 20 " 500 2.0 19 E(173) 100 0.5 19 F(173) 100 0.5 19 " 500 2.0 19 " 500 1.0 1.5 20 " 500 1.0 1.5 20 G(175) 100 1.5 20 G(175) 100 1.0 20 H(174) 100 1.5 20 " 5.5 20 " 5.0 20 " 5.0 20 " 5.0 20 " 7.0 10 " 7.0 10 " 7.0 20	10.4 10.6 10.1 9.6 9.5	10.2 10.6 10.6 9.6 9.5	37.5 44.4 54.0 54.0 46.8 48.5 37.1 32.6 44.4	8.20 51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				7.1	23.9 12.7 18.3 46.3 40.7 51.9
E (172) 100 0.5 19 " 300 1.0 19 " 4.0 20 " 4.0 20 " 4.0 20 " 4.0 1.9 " 500 2.0 19 " 500 1.0 17 " 300 " 23 " 400 3.0 18 " 500 1.5 20 " 500 1.5 20 " 500 1.5 20 " 500 1.5 20 " 4.0 16 16 " 300 2.0 21 H(174) 100 1.5 22 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 " 200 3.0 20 "	10.6 10.1 9.6	10.6 10.6 9.6 9.5	31.6 44.4 54.0 54.0 46.8 48.5 37.1 32.6 44.4	51.86 25.95 2.57 6.94 5.71 12.00 21.36 16.74				1.5	12.7 18.3 46.3 40.7 51.9
E(172) 100 0.5 19 " 300 1.0 19 " 400 1.5 19 " 400 1.5 19 " 500 2.0 19 " 500 2.0 19 " 500 1.0 19 " 300 " 23 " 300 " 23 " 400 3.0 18 " 500 1.5 20 " 500 1.5 20 " 500 1.5 20 " 4.0 16 16 " 300 2.0 21 " 300 2.0 21 " 300 2.0 20 " 300 2.0 20 " 4.0 1.5 20 " 300 2.0 20 " 300 2.0 20 " 2.0 2.0 20 " 2.0 2.0 2.0 " 2.0 2.0 2.0 " 2.0 2.0 2.0 " 2.0	. 10.6 10.1 9.6 9.5	10.6 10.6 9.5 9.5 9.5	31.6 44.4 54.0 54.0 46.8 37.1 32.6 44.4	51.86 25.95 2.57 2.57 6.94 5.71 12.00 21.36 16.74				7.1	12.7 18.3 46.3 40.7 51.9
F(173) 100 1.0 18 F(173) 100 0.5 19 G(175) 100 1.0 20 G(175) 100 1.0 20 G(175) 100 1.0 20 G(175) 100 1.0 20 H(174) 100 1.5 21 H(174) 100 1.5 22 H(174) 100 1.5 22 H(174) 100 1.5 22 H(174) 100 1.5 22	9.6	10.6 9.6 9.5 9.5	44.4 46.8 48.5 37.1 37.1 37.1 37.1 37.1	25.95 2.57 6.94 5.71 12.00 21.36 16.74				7.1	18.3 46.3 40.7 51.9
F(173) 100 1.0 20 F(173) 100 0.5 19 C(175) 100 1.0 20 C(177) 100 1.0 20 C(178) 100 1.0 20 C(178) 100 1.0 20 C(179) 100 1.5 20 C(179) 100 2.0 20 C(171) 100 1.5 20 C(171) 100 1.5 20 C(171) 100 1.5 20 C(172) 100 2.0 20 C(173) 100 1.5 20 C(174) 100 1.5 2.2 22 C(174) 100 2.0 20 C(175) 100 2.0 20	9.6	9.6 9.5 8.9	54.0 46.8 48.5 37.1 32.6 44.4	2.57 6.94 5.71 12.00 21.36 16.74 53.34					46.3 40.7 51.9 40.7
F(173) 100 0.5 20 F(173) 100 0.5 19 F(173) 100 0.5 19 F(174) 100 0.5 19 G(175) 100 1.0 20 G(175) 100 1.0 20 G(175) 100 1.0 20 H(174) 100 1.5 20 H(174) 100 1.5 20 Soo 3.0 2.0 H(174) 100 1.5 20 Soo 3.0 2.0 Soo 3.0 2.0 H(174) 100 1.5 20 Soo 3.0 2.0	9.5	9.5	46.8 48.5 37.1 32.6 44.4	6.94 5.71 12.00 21.36 16.74 53.34				40.7	40.7 51.9 40.7
H(174) 100 1.5 19 F(174) 100 0.5 19 F(175) 100 0.5 19 F(177) 100 0.5 19 F(177) 100 0.5 19 F(177) 100 0.5 19 F(178) 100 1.0 20 F(178) 100 1.0 20 F(178) 100 1.0 20 F(179) 100 1.5 20 F(179) 100 1.5 20 F(179) 100 1.5 20 F(179) 100 2.0 20 F(179) 100 1.5 20 F(179) 100 1.5 20 F(179) 100 1.5 20 F(179) 100 1.5 20 F(179) 100 20 F(179) 100 20 F(179) 100 20		9.5	48.5 37.1 32.6 44.4 371.1	5.71 12.00 21.36 16.74 53.34				29.5	51.9 40.7
F(173) 100 0.5 19 F(173) 100 0.5 19 T(173) 100 0.5 19 T(173) 100 0.5 19 T(174) 100 1.0 20 T(175) 100 1.0 20 T(175) 100 1.0 20 T(176) 100 1.0 20 T(177) 100 1.0 18 H(174) 100 1.5 20 T(177) 100 1.5 20 T(177) 100 1.0 20 T(177) 100 1.0 20 T(177) 100 1.5 20 T(177) 100 20 T(177) 100 20	9.6		37.1 32.6 44.4 371.1	12.00 21.36 16.74 53.34		_		35.1	40.7
F(173) 100 0.5 19 F(173) 100 0.5 19 300 1.0 17 300 1.0 23 400 3.0 18 G(175) 100 1.0 20 G(175) 100 1.0 20 H(174) 100 1.5 21 H(174) 100 1.5 22 20 20 20 20 20 20 20 20 20	9.5	9.5	32.6 44.4 371.1	21.36 16.74 53.34		_		18.3	
F(173) 100 0.5 16 200 1.0 17 200 1.0 17 300 23 400 3.0 18 6.5 20 G(175) 100 1.0 20 6.5 20 H(174) 100 1.5 21 H(174) 100 20 100 20 100 20 100 20 100 20 100 20	10.0	6.6	371.1	16.74		_		18.3	29.5
F(173) 100 0.5 19 " 200 1.0 17 " 300 " 23 " 400 3.0 18 " 500 1.5 20 " 500 1.5 20 " 200 1.0 20 " 200 3.0 21 " 300 2.0 20 " 300 2.0 20 " 200 3.0 21 " 200 3.0 20 " 200 3.0 20 " 200 3.5 22 " 200 3.0 20 " 10.0 20	8.6	8.7	371.1	53.34				12.7	23.9
G(175) 100 0.5 17 17 17 17 17 17 17 17 17 17 17 17 17	-	-	7.1.1.	7.7.7		_		- 5	7.1
G (175) 100 1.5 21 23 24 20		7				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			10.2
G (175) 100 1.5 2.0 G (175) 100 2.0 H (174) 100 1.5 B S.O 2.0 C (174) 100 1.5 C (175) 100 2.0	10.9		46.0	14.69		_		C	10.5
G (175) 100 1.0 20 G (175) 100 1.0 20 G (174) 100 1.0 20 H (174) 100 2.0 21 H (174) 100 2.0 2.0 H (174) 100 2.0 2.0 H (174) 100 1.5 2.1 H (174) 100 2.0 H (174) 100 2.0 H (175) 100 2.0 H (177) 100 2.0	6.6	6.6	39.8	21.04	5.0 67			18.3	35.1
G (175) 100 1.0 20 G (175) 100 1.0 20 G (175) 100 1.0 20 H (174) 100 2.0 2.0 H (174) 100 1.5 2.0 S S S S S S S S S S S S S S S S S S S	9.6		47.5	4.51				23.9	46.3
G (175) 100 1.5 20 G (175) 100 1.0 20 " 200 3.0 21 H (174) 100 1.5 5.5 20 20 30 20 21 4.0 16 18 21 22 23 24 27 29 20 20 20 20 20 20 20 20 20	9.5	9.5	34.0	13.64		58.4 23.3	3 8.06	7.1	35.1
G (175) 100 1.0 20 G (175) 100 1.0 20 1.0 20 3.0 21 1.1 300 2.0 20 H (174) 100 1.5 21 200 3.0 20 1.1 5.5 22 1.1 1.2 200 1.2 200 1.3 200 1.5 21	10.0	9.9 10.1	38.6	39.22	-48.6 92	_		7.1	23.9
G (175) 100 1.0 20 " 200 3.0 21 " 200 3.0 21 " 300 2.0 20 " 8.0 21 H (174) 100 1.5 21 " 200 3.0 20		8.6	46.1	44.77				1.5	18.3
G (175) 100 1.0 20 " 200 3.0 21 " 200 3.0 21 " 300 2.0 20 " 8.0 21 H (174) 100 1.5 21 " 200 3.0 20 " 200 20		4						4	10.7
H(174) 100 1.5 2.1 2.0 2.0 2.1 2.1 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0		9.8 10.2	÷ ;	56.94	-131. 00	200.3	0.30	. ·	10.7
H(174) 100 1.5 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0	8.6	9.1	2.1.6	51.70		_		2 6	
H (174) 100 1.5 2.1 2.0 2.0 2.0 2.0 2.0 2.0 2.1 2.1 2.0 2.1 2.1 2.0 2.0 2.1 2.1 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0	10.2		39.4	6/:/		_		2.67	51.5
H(174) 100 1.5 21 20 20 8.0 21 1.5 21 5.5 22 20 30 20 10.0 20	9.7	9.7	32.9	10.51		_		29.5	5.0
H(174) 100 1.5 21 5.5 22 200 3.0 20 10.0 20	10.0		20.4	26.33		_		12.7	40.7
H (174) 100 1.5 21 22 22 22 200 3.0 20 20 20	10.0	6.6	23.2	39.35				12.7	35.1
200 3.0 20	6'6	9.7	42.5	10.62				35.1	40.7
3.0 20	9.7	8.6 9.6	40.5	17.95				12.7	35.1
10.0 20		6.6	49.8	13.73		75.5 35.7		29.5	40.7
	9.7	9.7 9.8	54.4	17.95		_		23.9	40.7
19	10.4	10.2	-12.7	02.99		1.10.7 7.1		1.5	12.7
19	6.6	0.01 8.6	45.5	89.17	~	53.8 7.1	1 4.54	1.5	12.7
	9'01	10.3	164.0	8'901		_		1.5	7.1

Table 2. continued.

Date	Transect	Distance from	Meter Depth.	Number of		Temperature, °C	ure, °C			Current Heading, degrees	ing, degrees			Current	Current Speed, cm.s.1	
	(Station)	CDN. shore, m	m	Readings	mean	s.d.	mın	тах.	rnean	s.d.	min.	max	mean	s.d.	min.	max.
July 1	B (170)	100	0.5	18	11.0	60 0	6.01	11.3	48.7	3.49	43.4	56.6	11.1	2.58	7.1	12.7
. :	=	200	1.5	18	110	0.03	10.9	11.1	61.6	2.22	57.0	64.3	35.7	1.81	35.1	40.7
2	=	=	5.0	19	10.9	0.03	10.9	11.0	57.1	3.94	49.7	64.3	29.5	3.23	23.9	35.1
2	;	300	1.5	21	011	0.05	11.0	11.11	68 1	2.82	58.7	72.0	41.5	4.44	29.5	46.3
2	1	2	5.0	20	110	00.00	0.11	11.0	67.5	5.04	6.55	9.77	292	4.25	23.9	35.1
z	:	00+	1.5	22	17.11	00.00	1.11	1.1	0+9	6.14	47.9	73.4	21.9	3.25	18.3	29.5
:	:	3	5.0	20	1.1	0.00	H	===	62.1	9.24	50.4	80.7	7.7	3.09	1.5	12.7
3	:	200	1.0	19	11.2	0.03	11.2	11.3	50.9	15.66	10.9	72.3	8.0	3.37	1.5	12.7
ź	7	009	1.0	16 ·	11.1	90.0	1.11	11.3	46.6	5.40	35.7	57.0	12.4	1.40	7.1	12.7
:	*	3	3.0	61	=	0.00		Ξ	40.2	5.21	30.8	50.0	11.2	3.15	7.1	18.3
[refer]	E (172)	100	> 0	1,	117	0.06	116	8	37.8	36.57	L 66-	7 201	5 -	000	5	
, inc	(7/1)7	200	3 =	61	11.5	0.05	7	11.5	66.6	17.43	47.6	105.9	5.9	2.33	2	7.1
z	4	300	1.0	. 20	11.2	0.08	11.2	2	8,48	000	51.4	58.0	29.2	131	23.9	29.5
:	1	#	4.0	19	=	0.00	=	===	53.3	2.96	48.6	59.1	23.9	1.86	18.3	29.5
2	3	700	2.0	61	11.2	0.04	11.1	11.2	49.2	4.01	38.1	58.4	35.7	4 50	23.9	40.7
z	;	=	9.6	20	I.I.	0.02	11.1	11.2	42.1	9.87	14.8	55.6	27.0	4.94	18.3	35.1
z	•	200	1.5	<u>8</u>	11.2	0.04	11.2	11.3	103.5	30.11	31.9	142.8	2.1	1.79	1.5	7.1
3	3	=	5.5	19	11.2	00.00	11.2	11.2	197.2	19.74	9'66	346.7	1.5	0.00	1.5	1.5
1	F 1143	001	u C	S		300	7.63	0 5	7 230		0.516	201	-			ľ
July 1	F (17.5)	001	0.5	07	17.7	50.0	0.71	8.71	0.757	21.61	6717	57.87	χ.	1.24	Ç.	7
\$	*	200	=	16	6.11	0.08	11.9	12.1	6.78	25.55	63.6	150.2	8.1	1.27	5:	7.1
=	1	300	1.0	81	11.5	90:0	11.5	11.7	6 ††	28.02	15.5	143.5	7.1	1.91	1.5	12.7
=	3	400	2.0	16	11.3	0.07	11.2	11.5	47.2	3.01	42.3	52.8	32.7	3 48	23.9	35.1
=	3	2	0.6	20	11.2	0.02	11.2	11.3	46.4	4.27	39.2	52.8	24.5	3.57	18.3	29.5
=	:	200	2.0	17	1	0.05	11.3	11.5	46.6	5.68	38.1	55.6	24.9	4.03	18.3	29.5
=	£	:	7.0	19	11.3	0.04	11.3	7 =	9.09	12.72	20.0	68.5	15.9	2.82	12.7	18.3
July 1	G (175)	100	1.0	61	11.2	0.08	11.2	11.5	33.8	17.30	7.4	8.09	11.2	2.52	7.1	12.7
` =	:	=	3.5	61	11.2	0.05	11.2	7.1	36.5	21.24	2.9	67.5	10.0	2.86	7 1	12.7
=	:	200	3.0	16	11.3	0.05	11.2	7:11	27.8	5.44	19.0	42.7	30.7	2.33	29.5	35.1
:	:	3	11.0	19	11.2	0 03	11.2	11.3	34.6	10.71	16.2	58.4	18.0	4.34	7.1	23.9
=	=	300	2.0	19	11.5	0.03	11.4	11.5	6.1	38.12	-47.9	89 1	9.2	4.98	1.5	18.3
3	:	:	8.0	21	7.	0.05	H.3	7.	32.1	39.27	-33.2	92.2	9.9	4.28	1.5	12.7
l vlail	H (174)	100	0.1	61	7	0.06	- 3	- 5	37.0	2.00	28.4	16.5	23.3	175	183	23.0
=	3	2 =	0.1	20	113	0.05	2	2 = 2	26.1	16.47	-59.1	86.7	75	3.66	1.5	12.7
:	:	200	2.5	21	11.5	0.0	7	911	824	11.38	7.4	6.69	27.1	4.52	12.7	35.1
=	3	3	10.0	21	11.4	0.04	11.4	11.5	51.5	14.86	10.9	9.77	21.2	2.86	18.3	23.9
5	:	300	1.5	21	11.7	0.26	11.4	12.2	39.6	73.75	-130.0	138.0	2.0	1.67	1,5	7.1
z	=	2	6.5	21	11.3	0.05	11.3	11.5	8.99	71.87	-74.8	184.0	2.0	1.67	1.5	7.1
:	=	400	1.0	16	11.7	0.11	911	11.9	47.1	42.00	-33.6	119.5	2.2	1.88	1.5	7.1

Table 2. continued.

Columbia	100	Teores	Dictioned from CDN	Moter Denth m	Number of		Temperature. °C	ture. °C			Current Head	Current Heading, degrees			Current S	Current Speed, cm.s.1	
B (170) 148 15 23 169 002 168 169 654 659 </th <th>Date</th> <th>(Station)</th> <th>shore, m</th> <th>שובות בלימוי ווו</th> <th>Readings</th> <th>mean</th> <th>s.d.</th> <th>min.</th> <th>тах.</th> <th>mean</th> <th>s.d.</th> <th>min.</th> <th>тах.</th> <th>mean</th> <th>s.d.</th> <th>min.</th> <th>max.</th>	Date	(Station)	shore, m	שובות בלימוי ווו	Readings	mean	s.d.	min.	тах.	mean	s.d.	min.	тах.	mean	s.d.	min.	max.
E(172) 200 10 24 10 24 167 006 167 169 601 4 209 570 10 10 10 10 10 10 10 10 10 10 10 10 10	Anonst 22	B (170)	148	1.5	23	16.9	0.02	16.8	16.9	55.0	8.32	33.3	67.1	12.5	8.00	1.5	29.5
E(172) 200 10 24 167 000 167 168 661 1427 449 44	177 167 11	7	252	1.0	23	16.7	90.0	16.7	16.9	62.4	2.09	57.0	66.1	53.1	4.03	40.7	57.5
E(172) 200 0.05 110 25 167 0.06 167 169 60.0 7.85 112 416 113 112 113 113 113 113 113 113 113 113	÷	:	3	4.0	24	16.7	0.02	16.7	16.8	60.1	5.29	49.3	71.3	47.0	4.37	35.1	51.9
E(172) 200 153 109 167 171 170 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170<	3	:	380	1.0	25	16.7	90.0	16.7	16.9	63.1	14 27	41.6	105.9	16.7	7.52	1.5	29.5
E(172) 200 0.5 18 172 0.06 167 169 600 7.85 31.2 E(172) 200 0.6 15 18 172 0.06 171 172 172 183 4107 133 172 173 173 173 173 173 173 173 173 173 173	ž	**	3	3.0	20	16.7	60.0	16.7	17.1	50.0	20.59	15.8	87.7	5.1	3.20	1.5	12.7
E(172) 200 0.5 18 172 0.04 171 172 171 172 0.04 171 172 171 0.05 169 169 169 169 169 169 169 169 169 169 169 169 169 169 169 169 169 171 0.02 441 260 434 """ 325 1.5 2.1 168 0.04 16.7 168 494 2.06 434 """ 2.5 1.5 2.1 168 0.05 168 169 35.4 450 450 451 """ 4.0 1.5 2.3 168 0.01 168 0.02 168 169 35.8 15.9 <td< td=""><td>3</td><td>=</td><td>909</td><td>1.5</td><td>21</td><td>16.8</td><td>90:0</td><td>16.7</td><td>6 91</td><td>0.09</td><td>7.85</td><td>31.2</td><td>71.6</td><td>5.4</td><td>2.80</td><td>1.5</td><td>7.1</td></td<>	3	=	909	1.5	21	16.8	90:0	16.7	6 91	0.09	7.85	31.2	71.6	5 .4	2.80	1.5	7.1
B			Ç	ų	0	- 1	0.0.1	17.1	17.3	105 3	41.07	138 3	3173	5 1	000	1.5	1.5
B (170)	August 22	E (172)	200	0.5	18	7.71	0.04		7:1	F. C.O.E.	11.01	2027	100	- <u>-</u>	37.6		7
B(170) 186 15 23 168 0.00 169 169 351 2.745 -301 B(170) 186 1.5 23 168 0.03 167 168 494 494 451 431 B(170) 186 1.5 23 168 0.03 168 169 358 12.54 109 C(171) 100 10 10 10 10 10 10	:	7.5	300	1.0	22	17.0	90:0	16.9	17/1	70.7	4.17	0.5.0	90.4	0 -	0.70) ·	
B (170) 168 004 167 168 494 4 20 434 """ 410 11.5 23 168 004 167 168 169 169 1434 240 434 """" 525 11.5 23 168 003 168 169 169 194 4151 151 """" 525 11.5 23 168 003 168 169 194 4151 109 """" 470 11.5 20 168 001 168 170 168 170 168 170 168 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 170 171 171 171<	2	**	=	3.0	17	6.91	00.00	16.9	16.9	53.1	27.26	-50.7	71.6	5.1	2.68	ST.	1.7
B (170) 186 167 0.03 168 169 453 451 451 433 B (170) 1.6 2.2 1.6 0.05 168 169 169 153 45.3 45.1 133 B (170) 1.6 1.5 2.3 1.68 0.01 168 169 35.8 12.54 109 B (170) 1.6 1.5 2.0 1.68 0.01 168 170 60.6 5.84 109 B (170) 1.6 1.0 1.0 1.0 1.0 1.0 1.0 109	=	=	410	1.5	21	8.91	0.04	16.7	16.8	49.4	2.60	43.4	54.2	48.7	2.77	46.3	51.9
B (170) 186 15 16 16 16 15 15 16 16 16 15 15 16 15 16 15 16 17 16 17 <	3	:	×	5.0	21	16.7	0.03	16.7	16.8	45.3	4.51	33.3	52.1	45.8	1.64	40.7	46.3
B (170) 186 168 168 168 169 35.8 12.54 109 B (170) 186 1.5 20 168 0.11 168 172 666 2.84 58.2 " 400 " 200 168 0.02 168 169 626 2.54 58.2 " 400 1.0 10 168 0.02 168 169 626 2.54 58.2 " 400 1.0 1.0 1.0 1.0 1.0 1.0 1.0 " 630 1.0 4.0 2.1 1.7 0.05 1.7 1.7 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1 1.0 1.1	33	:	525	1.5	23	16.8	0.05	16.8	16.9	39.4	11.53	15.1	64.7	11.0	5.07	7.1	23.9
B (170) 186 1.5 20 168 0.11 168 172 606 58.3 42.0 " 400 " 20 168 0.02 168 170 83.9 87.4 58.2 " 400 1.1 1.0 1.0 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0 1.0 1.1 1.0	3	**	=	4 v	23	8.91	0.03	16.8	6.91	35.8	12.54	10.9	58.7	8.01	5.12	1.5	23,9
B(70) 186 1.5 20 16.8 0.11 16.8 17.2 60.6 5.83 42.0 " 300 " 20 16.8 0.02 16.8 17.0 8.15 5.4 58.2 " 400 1.0 19 16.9 0.02 16.8 17.0 8.15 5.49 58.2 " 470 1.5 2.2 17.0 0.03 17.0 17.1 17.0 8.15 54.9 58.9 54.9 58.9 56.1 51.8 51.0 54.9 54.9 58.9 56.1 51.8 54.9 58.9 56.1 51.8 56.1 51.8 54.9 56.1 51.8 54.9 56.1 51.8 54.9 56.1 51.8 56.1 51.8 56.1 51.8 56.1 51.8 56.1 51.8 56.1 51.8 56.1 51.8 56.1 58.9 52.9 56.1 58.9 52.9 58.1 52.9 58.1																	
" 300 " 20 168 0.02 168 169 626 254 38.2 " 400 15 169 0.02 169 170 813 8.76 71.3 " 400 15 22 170 0.02 170 171 710 8.39 8.76 71.3 " 400 15 22 171 0.02 170 171 710 8.75 541 518 " 200 0.75 24 189 0.04 196 198 23.7 27.97 1704 " 200 0.75 24 189 0.05 188 190 20.05 41.8 1704 " 300 1.0 16 17.1 0.20 16 17.4 17.9 30.4 18.3 17.1 " 404 " 1.71 0.20 16.9 17.4 17.9 30.4 18.3 17.1	Aupust 23	B (170)	981	1.5	20	16.8	0.11	16.8	17.2	9.09	5.83	42.0	73.7	33.3	4.09	23.9	40.7
a 400 1.0 19 6.9 0.02 16.9 17.0 81.9 87.6 71.3 a 470 1.5 2.2 17.0 0.05 17.0 17.1 71.0 81.9 8.76 71.3 a 630 " 2.2 17.0 0.05 17.0 17.1 71.0 81.5 54.9 56.1 51.8 b 100 4.0 2.1 19.7 0.04 19.6 19.8 19.0 56.1 51.8 51.8 17.0 17.1 17.0	1	3	300	=	20	16.8	0.02	16.8	6.91	62.6	2.54	58.2	68.5	59.3	5.02	42.6	63.1
E(172) 100 470 1.5 22 170 0.05 170 171 815 549 D(171) 100 40 21 197 0.04 196 198 232.7 27.97 1704 E(172) 200 0.75 24 189 0.05 188 190 20.5 41.50 1718 E(172) 200 0.75 24 189 0.05 188 190 20.5 41.50 1718 E(172) 200 0.75 24 189 0.05 188 190 20.5 41.50 1718 E(172) 200 1.0 1.7 0.20 169 170 171 170 20.5 171 170 20.5 171 171 20.5 171 171 20.0 41.43 136.2 E(173) 100 1.0 1.0 1.0 1.0 1.1 1.0 1.1 1.0 1.1 1.1 1.1	;	:	400	1.0	19	6.91	0.02	6.91	17.0	83.9	8.76	71.3	9.66	3.0	2.47	1.5	7.1
n 630 " 22 17.1 0.02 17.0 17.1 57.9 561 51.8 D(771) 100 4.0 21 197 0.04 196 198 237.7 27.97 1704 " 200 0.75 24 189 0.05 18.8 19.0 220.5 41.50 1704 " 304 1.5 21 176 0.12 174 179 30.4 18.88 10.0 " 300 2.0 1.0 16 17.1 0.20 16.9 17.6 30.4 18.8 10.5 " 404 " 1.6 17.1 0.20 16.9 17.6 33.7 27.7 17.8 " 404 " 1.8 17.1 0.20 17.1 17.2 17.4 30.9 37.84 -59.4 " 300 1.5 2.1 17.1 0.05 17.1 17.2 17.4 48.0	**	3	470	1.5	22	17.0	0.05	17.0	17.1	71.0	8.15	54.9	93.3	4 0	2.79	1.5	7.1
E(172) 100 4.0 21 19.7 0.04 196 19.8 232.7 27.97 170.4 " 200 0.75 24 18.9 0.05 18.8 19.0 220.5 41.50 171.8 " 304 1.5 24 18.9 0.05 18.8 19.0 220.5 41.50 171.8 " 304 1.5 21 17.6 0.12 17.4 17.9 30.4 18.8 -10.5 " 40.4 " 1.0 1.0 0.0 17.4 17.9 30.4 18.8 -10.5 " 40.4 " 1.0 1.0 0.0 17.1 17.0 17.1 33.7 25.8 29.1 " 40.4 " 1.8 17.1 0.12 17.1 17.2 33.7 35.7 27.6 " 5.80 1.5 2.1 17.1 0.05 17.1 17.2 27.9 17.1	3	8	630	:	22	17.1	0.02	17.0	17.1	57.9	5.61	51.8	79.3	11.7	2.74	1.5	12.7
D(171) 100 4.0 21 19.7 0.04 19.8 19.8 235.7 27.9 17.4 " 200 0.75 24 18.9 0.05 18.8 19.0 220.5 41.50 171.8 " 304 1.5 21 17.6 0.12 17.4 17.9 30.4 41.8 10.1 " 304 1.5 21 17.6 0.12 17.4 17.9 30.4 18.8 10.5 " 300 2.0 1.0 1.0 1.0 0.0 17.0 17.1 30.4 41.8 10.1 " 40.4 " 8.0 2.2 16.9 0.02 17.0 17.1 30.4 46.5 29.1 17.0 49.7 20.0 46.5 49.7 20.0 46.5 49.7 20.0 46.5 49.7 20.0 46.5 49.7 20.0 46.5 49.7 49.7 49.7 49.7 49.7 49.4<					1				0		10	7	0	0	100	-	7.1
E(172) 200 075 24 18.9 0.05 18.8 19.0 220.5 41.50 17.18 E(172) 200 1.6 1.7.1 0.20 16.9 17.6 337.0 25.80 297.1 " 300 2.0 1.0 16 17.1 0.20 16.9 17.6 337.0 25.80 297.1 " 404 " 1.0 1.0 1.0 17.1 0.0 17.1 17.2 33.5 12.0 " 404 " 8.0 2.2 16.9 0.0 17.1 38.3 25.7 12.0 " 4.0 1.5 2.1 17.1 0.05 17.1 17.2 48.7 25.9 46.5 " 5.2 2.3 17.2 0.05 17.1 17.2 48.0 37.84 -59.4 48.5 48.20 18.3 " 2.0 1.0 0.0 17.1 17.2 17.4 19.0	August 23	D(171)	100	4.0	21	19.7	0.04	961	8.61	232.7	27.97	170.4	232.4	0 1	51.1	 	7.1
E(172) 200 1.0 16 17.1 0.20 16.9 17.6 337.0 25.80 297.1 30.4 18.38 -10.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	3	:	200	0.75	24	6.81	0.05	8.8	0.61	220.5	41.50	8.171	532.4	1.7	1.12	C. I	1.7
E(172) 200 1.0 16 17.1 0.20 16.9 17.6 233.0 25.80 297.1 " 40.4 " 10 16 17.0 0.04 17.0 17.1 58.3 35.57 12.0 " 40.4 " 18 17.1 0.12 17.0 17.5 49.7 2.00 46.5 " 580 1.5 2.2 16.9 0.02 16.9 17.0 17.2 2.00 46.5 " 580 1.5 2.1 17.1 0.05 17.1 17.2 2.00 46.5 " 6.5 2.3 17.0 0.05 17.1 17.2 33.0 41.43 136.2 " 2.20 1.75 2.1 17.1 0.05 17.1 17.2 48.0 135.5 " 4.0 2.0 2.2 17.1 17.2 17.4 139.5 44.0 17.3 " 1.0	*	2		1.5	21	17.6	0.12	17.4	17.9	30.4	18.58	-10.5	53.9	8.9	3.66	2	17.7
E(112) 200 1.0 16 17.1 0.20 16.9 17.0 17.3 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.1 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.2 17.0 17.1 17.2 17.0 17.1 17.2 17.0 17.1 17.2 17.0 17.1 17.2 17.2 17.1 17.2 17.2 17.1 17.2 17.2 17.1 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 17.2 1		i i	000	-	2	17.1	0.00	16.0	17.6	127.0	25.80	1 207 1	175 5	1 0	1 36	5	7.1
4,004 2,0 17,1 0.02 17,0 17,3 49,7 200 46,5 1 1,0 22 16,9 0.02 16,9 17,0 17,1 20 46,5 1 1,5 21 17,1 0.05 17,1 17,2 27,7 35,87 -27,6 1 0,0 1,0 0.05 17,1 17,2 17,1 32,0 37,84 -59,4 1 220 1,7 0.05 17,1 17,2 17,1 48,0 37,84 -59,4 1 220 1,7 0.05 17,1 17,2 17,4 136,2 48,0 135,5 1 220 1,7 0.05 17,1 17,2 17,4 29,8 5.27 18,3 1 0,0 2,0 2,3 17,2 0.05 17,1 17,4 17,9 48,0 13,5 48,2 13,5 48,0 13,5 48,0 13,5 48,0 13,5	August 23	E (1/2)	200	0.1	0 0	17.0	0.20	17.0	17.1	58.3	35.57	12.0	142.5	8	1.25	1.5	7.1
F(173) 100 1.0 20 17.3 0.05 17.0 17.1 17.2 35.87 -27.6 17.1 17.2 220 17.5 17.1 17.2 220 17.1 17.2 220 17.2 17.4 239.6 41.43 136.2 17.1 17.2 220 17.5 21 17.1 0.05 17.1 17.2 220 17.5 21 17.1 0.05 17.1 17.2 220 17.5 21 17.1 0.05 17.1 17.2 220 17.2 17.3 17.2 2.0 17.1 17.4 239.5 48.20 135.5 17.2 17.1 17.4 239.5 48.20 135.5 17.2 17.1 17.4 239.5 48.20 135.5 17.2 17.2 17.4 17.2 230 17.2 17.4 17.3 230.5 17.2 17.4 17.5 29.8 5.27 18.3 17.2 0.05 17.1 17.2 17.4 17.9 36.01 -29.4 17.2 17.2 17.4 17.5 20.4 17.1 17.2 23.4 17.1 17.2 23.4 25.1 17.3 17.3 17.5 20.6 17.2 17.4 49.4 14.10 23.5 17.2 17.2 17.4 49.4 14.10 23.5 20.5 17.1 17.2 17.4 49.4 14.10 23.5 20.5 17.1 17.2 17.4 49.4 14.10 23.5 20.5 17.1 17.2 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.1 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 14.10 23.5 20.0 17.2 17.4 49.4 49.4 49.4 49.4 49.4 49.4 49.4 4	3	3	300	7.O "	2 20	17.1	0.12	17.0	17.5	49.7	2.00	46.5	55.2	47.9	2.51	46.3	51.9
F(173) 100 1.5 21 17.1 0.05 17.1 17.2 57.7 35.87 -27.6 F(173) 100 1.0 20 17.0 0.05 17.1 17.2 17.4 48.0 37.84 -59.4 F(173) 100 1.0 20 17.3 0.05 17.2 17.4 239.0 41.43 136.2 " 220 1.75 21 17.3 0.05 17.1 17.2 339.5 48.20 135.5 " 9.0 2.3 17.2 0.05 17.1 17.4 239.6 41.43 136.2 " 9.0 2.3 17.2 0.05 17.1 17.4 139.5 48.20 135.5 " 404 2.5 21 17.2 0.05 17.1 17.4 17.9 36.1 29.4 18.3 G(175) 100 1.0 19 17.3 0.0 17.2 17.4 49.4 14.10	:	2	=	8.0	22	16.9	0.02	16.9	17.0	41.7	3.20	35.7	46.9	41.0	3.57	35.1	46.3
F(173) 100 1.0 20 17.0 0.05 17.0 17.1 48.0 37.84 -59.4 F(173) 100 1.0 20 17.3 0.05 17.2 17.4 239.0 41.43 136.2 " 220 1.75 21 17.1 0.05 17.1 17.2 329.5 48.20 135.5 " 200 2.0 2.3 17.2 0.05 17.1 17.4 29.8 5.27 18.3 " 404 2.5 21 17.2 0.05 17.1 17.4 136.2 -36.0 " 404 2.5 2.1 17.2 0.05 17.1 17.2 18.3 5.9.4 29.4 18.3 G(175) 100 1.0 19 17.3 0.0 17.2 17.4 49.4 14.10 23.5 " 200 2.5 2.6 17.2 0.0 17.2 17.4 49.4 14.10 23	:	:	580	1.5	21	17.1	0.05	17.1	17.2	57.7	35.87	-27.6	140.4	10.3	7.04	1.5	29.5
F(173) 100 1.0 20 17.3 0.05 17.2 17.4 239.0 41.43 136.2 " 220 1.75 21 17.1 0.05 17.1 17.2 18.3 " 300 2.0 23 17.2 0.05 17.1 17.4 29.8 5.27 18.3 " 404 2.5 21 17.2 0.05 17.1 17.4 29.8 5.27 18.3 " 404 2.5 21 17.2 0.05 17.1 17.4 17.9 36.01 -29.4 " 404 2.5 21 17.2 0.05 17.1 17.2 28.4 25.17 -9.8 G(175) 100 1.0 19 17.3 0.0 17.2 17.4 49.4 14.10 23.5 " 200 2.5 26 17.2 0.0 17.2 17.4 49.4 14.10 23.5 " <td< td=""><td>*</td><td>:</td><td>=</td><td>6.5</td><td>2.3</td><td>17.0</td><td>0.05</td><td>17.0</td><td>17.1</td><td>48.0</td><td>37.84</td><td>-59.4</td><td>105.5</td><td>10.3</td><td>5.43</td><td>1.5</td><td>18.3</td></td<>	*	:	=	6.5	2.3	17.0	0.05	17.0	17.1	48.0	37.84	-59.4	105.5	10.3	5.43	1.5	18.3
F(173) 100 1.0 20 17.3 0.05 17.2 17.4 2.9 41.43 136.2 " 220 1.75 21 17.1 0.05 17.1 17.2 17.4 2.9 48.20 135.5 " 2.0 2.3 17.2 0.05 17.1 17.4 29.8 5.27 18.3 " 404 2.5 21 17.2 0.05 17.1 17.9 36.0 -29.4 " 404 2.5 21 17.2 0.05 17.1 17.9 36.0 -29.4 " 404 2.5 2.3 17.2 0.05 17.1 17.2 28.4 25.17 -9.8 G(175) 100 1.0 19 17.3 0.0 17.2 17.4 49.4 14.10 23.5 " 200 2.5 26 17.2 17.4 49.4 14.10 23.5 " 2.0 2.0 <t< td=""><td></td><td></td><td></td><td></td><td>,</td><td></td><td></td><td></td><td></td><td>0 0</td><td>;</td><td></td><td>6 500</td><td></td><td>0</td><td>9 1</td><td>2</td></t<>					,					0 0	;		6 500		0	9 1	2
G(175) 100 1.0 19 17.2 0.05 17.1 17.2 18.3 48.20 155.5	August 23	F(173)	100	0.1	20	17.3	0.05	17.2	4.7	0.652	41.43	136.2	293.3	C. C.	0.00	C. 1	. ·
G(175) 100 1.0 19 17.2 0.05 17.1 17.4 29.8 5.27 18.3 18.3 18.3 18.3 18.3 18.3 18.3 18.3	:	2	220	1.75	21	17.1	0.05	1./.1	17.7	3.29.5	48.20	55.5	393.0	0.7	2.20	<u> </u>	1.7
G (175) 100 1.0 19 17.3 0.04 17.3 17.5 17.4 17.9 36.0 25.1 17.2 0.05 17.2 17.4 17.9 36.0 29.4 17.3 17.5 200 2.5 2.5 2.5 2.5 2.5 17.2 17.2 17.4 17.9 36.0 29.4 17.3 17.5 20.0 2.5 2.0 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5	:	3	300	2.0	23	17.2	0.05	17.1	17.4	29.8	5.27	18.3	39.2	- 54 -	5.13	18.3	40.7
G (175) 100 1.0 19 17.2 0.05 17.2 17.4 17.9 56.01 -29.4 G (175) 1.00 1.0 1.0 19 17.2 0.00 17.2 17.4 17.5 2.5.17 -9.8 G (175) 1.00 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.	:	3	3	0.6	25	17.0	0.02	17.0	17.1	15.0	16.29	-36.0	88.8	8.07	6.53	1.7	33.1
G (175) 100 1.0 19 17.3 0.04 17.3 17.5 35.5 9.95 11.3 17.2 0.00 17.2 17.4 49.4 14.10 23.5 17.2 10.0 29 17.1 17.2 0.00 17.2 17.4 49.4 14.10 23.5 11.3 10.0 29 17.1 17.2 17.2 17.2 17.2 17.2 17.2 17.2	:	:	404	2.5	21	17.2	0.05	17.2	17.4	17.9	36 01	-29.4	7.66	7 %	8.40	<u>.</u>	23.9
G(175) 100 1.0 19 17.3 0.04 17.3 17.5 35.5 9.95 11.3 17.5 2.00 17.2 17.4 49.4 14.10 23.5 17.2 2.00 2.9 17.1 0.05 17.1 17.2 28.9 12.28 -25.9 17.3 0.06 17.2 17.4 24.7 5.82 12.0	:	:	3	9.5	23	17.2	0 03	17.1	17.2	28.4	25.17	8.6-	103.1	12.2	6.99	5:1	23.9
3.0 21 172 0.06 17.2 17.4 49.4 14.10 23.5 200 2.5 26 17.2 0.00 17.2 17.2 32.1 3.91 22.1 10.0 29 17.1 0.05 17.1 17.2 28.9 12.28 -25.9 4 10.0 24 17.3 0.06 17.2 17.4 24.7 5.82 12.0	August 23	G (175)	001	1.0	61	17.3	0.04	17.3	17.5	35.5	9.95	11.3	51.1	11.2	3.56	7.1	18.3
200 2.5 26 17.2 0.00 17.2 17.2 32.1 3.91 22.1 10.0 29 17.1 0.05 17.1 17.2 28.9 12.28 -25.9 17.3 0.06 17.2 17.4 24.7 5.82 12.0	=======================================	3	3	3.0	21	17.2	90:0	17.2	17.4	49.4	14.10	23.5	77.2	6.0	3.29	1.5	12.7
" 266 2.0 24 17.3 0.06 17.2 17.4 24.7 5.82 12.0	=	3	200	2.5	26	17.2	00.00	17.2	17.2	32.1	3.91	22.1	39.5	37.3	3.14	29.5	40.7
266 2.0 24 17.3 0.06 17.2 17.4 24.7 5.82 12.0	-	=	3	10.0	29	17.1	0.05	17.1	17.2	28.9	12.28	-25.9	43.4	28.5	4.89	12.7	35.1
21 mg	2	**	266	2.0	24	17.3	90.0	17.2	17.4	24.7	5.82	12.0	32.6	30.9	5.66	23.9	40.7
8.0 25 17.2 17.2 19.8 14.15 -6.7	3	3	3	8.0	25	17.2	00.00	17.2	17.2	8.61	14.15	-6.7	41.6	17.0	6.58	1.5	23.9

Table 2. continued.

Date	Transect	Distance from CDN. Meter Depth, m	. Meter Depth, m	Number of		Temperature, °C	ure, °C			Current Heading, degrees	ing, degrees			Current S	Current Speed, cm.s-1	
	(Station)	shore, m		Readings	mean	s.d.	min.	max.	mean	s.d.	min.	тах.	mean	s.d.	min.	max
August 24	AB ()	100	0.1	18	16.6	0.48	15.9	17.0	283.2	87.19	129.2	369.9	2.4	2.80	1.5	12.7
3		200	1.0	20	17.0	0.05	16.9	17.1	65.8	2.85	8.65	70.6	46.0	1.22	40.7	46.3
=	:	=	3.0	16.0	17.0	4.12	17.0	17.0	66.5	16.44	58,4	9.07	39.0	9.74	35.1	40.7
	:	300	1.5	18	17.0	00.0	17.0	17.0	6.19	2.62	56.6	67.5	6.09	2.73	57.5	63.1
ž	1	404	0.75	14	17.1	0.10	16.7	17.1	83.2	44.47	-64.6	134.1	5.1	3.42	1.5	12.7
5	3	620	1.0	24	17.1	0.03	17.1	17.2	0.89	90.8	549	93.6	16.7	4.11	12.7	29.5
3	3	2	3.0	61	0.71	0.04	17.0	17.1	55.8	7.52	36.1	65.4	12.1	3.09	7.1	18.3
Angust 24	D (171)	100	0.5	20	18.6	0.33	17.8	19.3	314.2	43.48	255.6	387.7	1.5	0.00	1.5	1.5
=	3	200	0.75	81	18.2	0.13	17.9	18.3	209.7	77.76	47.9	307.6	2.7	2.33	1.5	7.1
3	=	300	1.5	21	17.6	0.28	17.0	0.81	6'19	22.18	29.1	103.8	8.4	4.54	1.5	18.3
August 24	E (172)	98	0.3	17	16.5	0.12	16.4	17.0	1943	42.14	144.2	263.9	1.5	0.00	1.5	1.5
3	:	. 200	0.75	19	8.91	0.28	16.1	17.0	216.7	58.31	134.5	323.3	2.1	1.72	1.5	7.1
:	3	330	2.0	61	17.2	80.0	6.91	17.3	38.8	15.54	6.91	74.1	23.3	4.02	12.7	29.5
:	15	3	5.0	17	17.1	0.07	16.9	17.2	34.4	15.38	7.4	65.0	20.9	4.35	12.7	23.9
:	44	423	2.0	18	17.1	00.00	17.1	17.1	50.1	4.86	38.8	57.3	28.6	2.80	23.9	35.1
:	3	=	8.0	15	17.0	0.04	17.0	17.1	45.2	16.6	26.3	64.0	16.8	6.62	7.1	29.5
:	4	580	2.0	20	17.1	0.04	16.9	17.1	44.6	9.92	27.0	62.6	27.3	5.43	7.1	35.1
2	3	3	7.0	91	17 0	0.12	9:91	17.1	36.8	11.87	14.1	64.0	19.3	6.92	1.5	29.5
, ,	E (172)	9	9	oc.	17.3	0.33	16.7	17.3	163.4	24.25	155.4	1717	, 1	000	2	, ,
August 24	(6/1).1	80.	0	0.7	7	77.0		0.1	107	27.11	0001			00.7	1 -	
:		214	5.1	77	17.2	0.19	1./1	8/1	310.3	45.99	0.061	306.4	×.9	17.4	2 5	177
*		300	2.0	20	17.2	0.08	17.2	17.5	29.1	6.80	67.1	47.2	28.9	3.50	18.3	35,1
:	:	=	8.0	16	17.1	0.02	17.1	17.2	24.9	11.35	2.5	51.4	28.5	4.52	1.2.1	35.1
3	32	406	2.0	21	17.2	0.07	6.91	17.3	22.1	5.14	13.4	32.2	33.0	8.01	12.7	40.7
4	ž	=	6.0	15	17.2	0.05	17.1	17.2	20.4	9.27	∞ ∞	47.6	28.8	2.79	23.9	35.1
August 24	G (175)	~100	1.0	27	17.3	0.10	16.9	17.5	33.0	7.28	18.3	59.1	11.2	4.20	1.5	18.3
3	3	=	3.0	27	17.1	0.12	8.91	17.2	30.4	16.84	-42.3	50.4	7.4	4.78	1.5	21.7
1	3	200	2.5	21	17.2	00.00	17.2	17.2	33.3	2.92	27.3	40.6	30.0	3.41	18.3	35.1
=	:	2	10.5	20	17.1	0.12	16.8	17.2	29.9	10.28	10.2	47.2	19.4	11.00	1.5	29.5
=	2	285	2.0	20	17.2	00.0	17.2	17.2	21.3	6.40	2.5	30.5	28.1	3.49	23.9	35.1
=	2	285	8.0	19	17.1	0.18	16.7	17.2	40.4	10.27	20.0	1.09	13.3	6.77	1.5	23.9

NOTES:

"mean" = arithmetic mean.
"s.d." = standard deviation.
"..." = approximately.
Transect "AB" is located approximately midway between Transects "A" and "B"

5.1.4 Interpretation of River Current and Plume Tracking Results

Reviewing the measured river current data from all dates, it can be readily seen that the river flow regime can be split into two general classes, namely "strong" and "weak".

The "strong" flow regime is characterized by: a relatively large mean current speed of over 20 cm.sec⁻¹ near the surface; a mean flow direction coincident with the mean downstream direction of the river; and, relatively small standard deviations of both the current direction and current speed (i.e., with respect to their mean values). This regime occurs in the deeper portions of the river. Stations typical of this regime include:

Transect B - 200, 300, 400 metres from the Ontario shore Transect E - 400, 500 " Transect F - 400, 500 " Transect G - 200, 300 " Transect H - 100, 200 "

The "weak" flow regime is characterized by: a relatively small mean current speed of under 10 cm.sec⁻¹, and relatively large standard deviations of both the current direction and current speed (i.e., with respect to their mean values). This regime is particularly prevalent over the shallow "shelf" region, on the north side of the river where the outfall discharges. Stations typical of this regime include:

Transect B - 100 metres from the Ontario shore Transect D - 100, 200, 300 " Transect E - 100, 200 " Transect F - 100, 200, 300 "

As can be seen from Figures 6 and 7, the drogues followed different travel paths from the outfall, depending upon daily wind conditions. Some general characteristics of these paths are summarized as follows:

- The paths are approximately parallel to shore (in the downstream direction) under SW and ESE wind directions (e.g., June 27 and August 22).
- The paths tend to run initially outward from shore at an approximate angle of 45 degrees for the first 200 metres or so of travel, under NE wind conditions (e.g., June 28, August 23 and August 24).
- The paths become parallel to the mean downstream river direction, after they reach the deeper portion of the river, (see August 23 and 24).

It may be concluded that, due to its "weaker" nature, the flow over the shallow "shelf" (where the outfall discharges) is more susceptible to wind variation than the deeper, faster-flowing waters of the main channel.

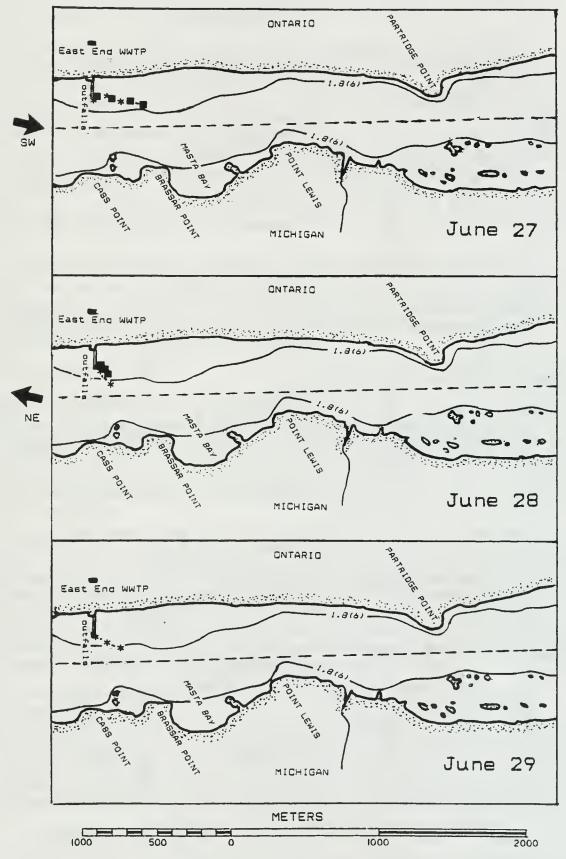


Figure 6. Drogue travel paths (* and •) on June 27, 28 and 29, 1989. The 1.8 metre (6 foot) water depth contour and average wind direction are included. The dashed line represents the Canada-United States border.

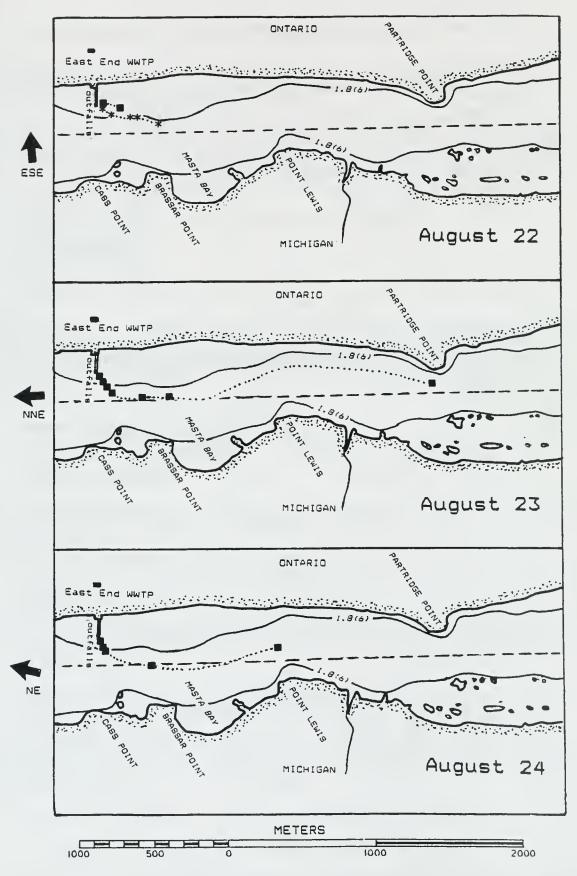


Figure 7. Drogue travel paths (* and ■) on August 22, 23 and 24, 1989. The 1.8 metre (6 foot) water depth contour and average wind direction are included. The dashed line represents the Canada-United States border.

5.2 Bacterial and Chemical Measurements

The maximum coefficients of variation (CV) for conventional chemical parameters in 19 pairs of blind duplicate (split) effluent and river water samples were usually considerably lower (1.4 to 46 %) than the maximum suspended solids, turbidity, phenolics, iron, zinc and bacteria (94 to 138 %). For many sample pairs, the results were identical or very similar (Appendix, Table A-5), indicating that laboratory analytical variability was very low. The higher variability for some parameters was due either to some samples with parameter concentrations near or below the respective minimum reportable values (e.g., phenolics, iron, zinc), which were assigned a value of zero for statistical calculations, or to the influence of particulates on the results of particulate-associated analytes (e.g., turbidity, bacteria, trace metals). The field blank results (Appendix, Table A-6) show that most of the field data for conductivity, chloride, turbidity, suspended solids, ammonia, total Kjeldahl nitrogen, total phosphorus, iron, and bacteria are above the distilled water "background".

The coefficients of variation range for most analytical parameters in two pairs of blind duplicate (split) sediment samples were usually quite low (0 to 67 %) and similar to the available laboratory CVs (Appendix, Table A-7), indicating that the local within-station sediment heterogeneity was relatively low. The maximum CV of 116 % was for fecal *Streptococcus* is in part due to the approximate nature of the results).

5.2.1 Effluent Quality

Densities of bacteria in the WWTP final effluent varied greatly, both between different survey days as well as within days (Table 1). For example, fecal coliforms ranged from 2,300 organisms.dl⁻¹ (organisms per 100 ml) to 75,000.dl⁻¹ during June 27, 1989, and reached a peak of 1,040,000 organisms. dl⁻¹ at 14:00 hours on August 22. Densities of *Escherichia coli* and *Pseudomonas aeruginosa* varied along with those of fecal coliforms (Table 1). Although the data set for *E. coli* is incomplete, this bacterium accounted for 42% to 85% of the fecal coliforms in the final effluent.

Conductivity, pH, chloride, ammonium and phenolics levels in the WWTP discharge changed relatively little during each sampling period, although all but ammonium were noticeably lower in the second survey (Table 1). Overall, turbidity and concentrations of suspended solids, total Kjeldahl nitrogen, total phosphorus, iron and zinc varied somewhat more, with ranges of 5.7 to 19.0 FTU, 18.2 to 45.3 mg.l⁻¹, 18.0 to 31.8 mg.l⁻¹, 0.60 to 2.42 mg.l⁻¹, 680 to 1200 µg.l⁻¹ and 16 to 60 µg.l⁻¹, respectively (Table 1). Concentrations of phosphorus in one of three samples on June 29 and two of three samples on August 22 exceeded the 1 mg.l⁻¹ (monthly average) GLWQA objective for WWTP discharges to the upper Great Lakes (IJC, 1988).

5.2.2 Effluent Loadings

The calculated loadings of bacteria and contaminants in Table 3 represent an important measure of the potential impact of the East End WWTP discharge on waters of the St. Marys River. Mean daily loadings were greatest for all parameters on August 22 (Fig. 8), reflecting the high discharge rate and the elevated concentrations in the effluent (Table 1). For example, relative to the lowest mean daily loading on August 24th, loadings on August 22nd were over 200 times

East End WWTP final effluent loadings. Table 3.

Sampling time	g time	Discharge	Suspended	Chloride	Fecal coliforms	Escherichia coli	Pseudomonas	Ammonium	Kjeldahl	Phosphorus Phenolics	Phenolics	Iron	Zinc
Date	Time	10'm'.day'	kg.day ⁻¹	kg day ⁻¹	10° org.day	10° org.day"	10° org.day	kg.day.1	kg.day ⁻¹	kg day ⁻¹	kg.day.1	kg.day.1	kg.day.1
June 27	0.434	38.5	808.5	3364.9	28875	20020	570	596.7	693.0	23.1	1.6	46.2	1.2
	0.4757	40.0	828.0	3648.0	920	089	% V	628.0	728.0	26.4	9.1	36.8	9.1
	0.5243	40.0	760.0	3632.0	20000	13200	~13	0.808	924.0	25.6	6.1	28.4	1.3
	mean	39.5	6.797	3547.1	8101	5644	<u></u>	671.5	775.4	24.9	1.7	36.4	1.3
June 28	;	380	771.4	3317.4	29260	155800	114	649.8	748.6	31.9	8.	45.6	6.1
	;	30.0	576.0	2763.0	1590	1200	~35	534.0	627.0	25.2	1.4	24.9	1.0
	;	30.0	639.0	2649.0	1800	1080	86~	654.0	756.0	27.3	1.7	24.0	6.0
	mean	32.5	656.5	2899.0	4393	2905	~73	610.7	708.8	27.9	1.6	30.1	1.2
June 29	0.3958	37.0	1095.2	3185.7	814	340	-11	8.909	791.8	37.7	1.9	31.4	2.2
	0 4375	30.0	642.0	2658.0	39600	16500	1380	486.0	594.0	24.0	1.5	:	7
	0.4792	31.0	564 2	2796.2	4030	2790	668	533.2	632.4	8 61	1.4	21 1	5.3
	mean	32.5	734.5	2869.1	5061	2501	~240	539.2	6.999	26.0	1.6	24.7	1.6
Aug. 22	0.4583	36.0	759.6	2707.2	25920	;	317	712.8	849.6	28.1	7	7.72	8.0
	0.5208	0.09	1920.0	4290.0	342000	;	1980	1494.0	0.8061	78.0	:	72.0	2.2
	0.5833	48.0	2174.4	3192.0	499200	:	3648	1075.2	1464.0	116.2	2.4	57.6	3.0
	теап	47.0	1471.1	3336.1	164252	:	1318	1046.7	1334.3	63.5	2.0	48.6	1.7
Aug. 23	0.375	30.0	738.0	2040.0	1410	;	99	5910	747.0	25.5	1.4	26.4	0.7
	0.4167	37.0	11729	26714	16650	;	244	740.0	906.5	27.7	1.7	37.0	8.0
	0.4583	37.0	969.4	2741.7	2035	:	170	7.907	913.9	24,1	9.1	29.2	9.0
	mean	34.5	6.11.6	2463.0	3628	1	140	676.2	852.2	25.9	1.5	30.6	0.7
Aug. 24	0.375	30.0	945.0	2025.0	420	300	9	564.0	717.0	27.0	1.3	23.1	0.7
	0.4167	35.0	885.5	2485.5	1505	910	318	637.0	780.5	26.6	1.3	25.6	6.0
	0.4583	37.0	695.6	2423.5	740	574	212	8.089	834.4	22.2	1.3	26.6	8.0
	теап	33.9	833.9	2308.8	777	539	~38	625.8	776.6	25.1	1.3	25.1	80
Study Mean	Jean	36.3	873.6	2869.7	6610	2168	~125	678.9	828.6	30.1	9.1	31.7	1.2

NOTES:

"mean" = geometric (log_m) mean.
"--"= information or data not available (sample spoiled in laboratory accident).
"-" approximately.
Bolded discharge rate exceeds the design capacity.

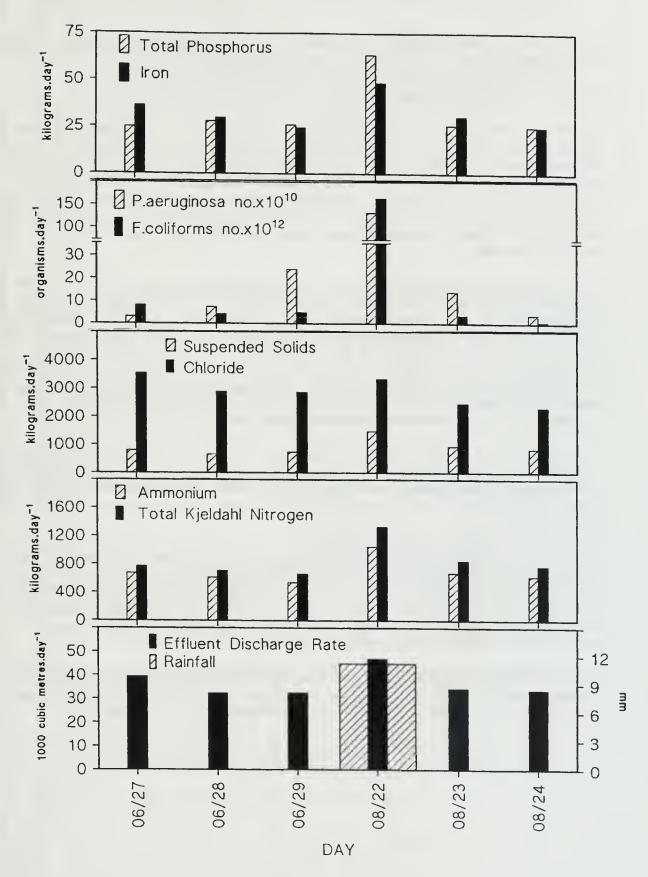


Figure 8. East End WWTP daily average discharge rates and loadings of selected contaminants.

greater for fecal coliform bacteria, and about two times greater for suspended solids, ammonia, total Kjeldahl nitrogen, total phosphorus, iron and zinc (Table 3).

5.2.3 River Water Quality

The WWTP effluent loadings (Table 3) had a noticeable effect on water quality in the Lake George Channel, not only immediately below the discharge at Transect C (Station 34), but also for some distance downstream. This impact was reflected both by concentrations as well as by exceedences of Provincial (PWQO) and Great Lakes Water Quality Agreement (GLWQA) objectives (Table 4). Fecal coliform, *Escherichia coli* and *Pseudomonas aeruginosa* bacteria, conductivity, chloride, ammonia nitrogen, total Kjeldahl nitrogen, phosphorus, phenolics, iron and zinc levels increased noticeably downstream of the WWTP discharge during both surveys (see Figs. 9 through 12).

The most pronounced effect on bacterial levels was found on August 22 and 23 during, and immediately following, a period of heavy rainfall and high effluent loadings (see Sections 5.1.1, 5.2.2, and Table 3). For example, densities of fecal coliform and *E. coli* bacteria reached a peak of 19,000 organisms.dl⁻¹ and 16,000 organisms.dl⁻¹, respectively, at 100 m downstream of the effluent discharge pipe on August 22. Faecal coliform densities exceeded the PWQO of 100 organisms.dl⁻¹ for the protection of recreational users for as far as Transect L (station 54) at Bell Point, some 4.7 km downstream (Fig. 12). A similar but less extensive trend was also evident for densities of *Pseudomonas aeroginosa*, with exceedences of the PWQO of 20 organisms.dl⁻¹ largely confined in downstream extent to 0.9 km at Transect F (Table 4).

Total phosphorus concentrations ranged from 33 μ g.l⁻¹ to 108 μ g.l⁻¹ immediately downstream of the WWTP discharge and these levels all exceeded the PWQO of 30 μ g.l⁻¹ for the prevention of excessive plant growth in rivers and streams (OMOE, 1984). Occasional samples from both the June and August surveys also exceeded the PWQO as up to 0.9 km downstream of the WWTP (Figs. 10 and 12).

The un-ionized ammonia PWQO of $20 \,\mu g.l^{-1}$ for the protection of aquatic life was only exceeded on one day, immediately downstream of the WWTP discharge ($26 \,\mu g.l^{-1}$ on August 24). Only two samples, taken on June 27 and on August 22, contained iron levels above the PWQ and GLWQA objective of $300 \,\mu g.l^{-1}$ for the protection of aquatic life. These concentrations, 1,200 and 2,000 $\,\mu g.l^{-1}$, respectively, correlated with noticeably elevated suspended solids concentrations in the water samples (Table 4 and Fig. 11).

The 1 µg.l⁻¹ PWQO for phenols to prevent tainting of edible fish flesh was frequently exceeded in samples collected from both upstream and downstream of the WWTP discharge. This indicates the presence and impact of upstream sources, in addition to the WWTP discharge.

Summary of Lake George Channel water quality data.

Table 4.

The control of the		COURTE																			
WWYP ON More Paris Pari	5	Distance fro	in metres		Sampling																
100 0.5 June 25 0.4 June	on er)	_	CDN. shore			Femperature		urbidity S	spiloS.dsn	Fecal	_	_	Conductivity	Chloride	Ammonia N	Un-ionized Ammonia	Total Kjeldahl N	Total Phosphorus	Phenolics	lron	Zinc
1,						Э.		FTU	mg.f	org.dl	org.dl		из ст. (@25.С		µg.I	нВн	ив.	нg.Г.	μg.1	µg.l.	μg.Γ.
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	(0,	100	100	0.5	June 28	9.4	7.83	0.87	4.7	~17	6~	\$	95.0	0.58 <t< td=""><td>21</td><td>0.2</td><td>061</td><td>J>6</td><td>0.8<t< td=""><td>061</td><td>1.8<t< td=""></t<></td></t<></td></t<>	21	0.2	061	J>6	0.8 <t< td=""><td>061</td><td>1.8<t< td=""></t<></td></t<>	061	1.8 <t< td=""></t<>
No. 1,		:	150	0.5	June 27	1	7.85	1.22	2.2 <t< td=""><td>7~</td><td>6~</td><td><2</td><td>0.96</td><td>1.60</td><td>38</td><td>1</td><td>170</td><td>F>9</td><td>0.5<t< td=""><td>90<t< td=""><td>0.9<t< td=""></t<></td></t<></td></t<></td></t<>	7~	6~	<2	0.96	1.60	38	1	170	F>9	0.5 <t< td=""><td>90<t< td=""><td>0.9<t< td=""></t<></td></t<></td></t<>	90 <t< td=""><td>0.9<t< td=""></t<></td></t<>	0.9 <t< td=""></t<>
No. 1,		3	=	=	June 29	;	7.98	0.80	1.8 <t< td=""><td><i>L></i></td><td>1></td><td>۳.</td><td>0.96</td><td>1.60</td><td>21</td><td>;</td><td>145</td><td>2<t< td=""><td>킈</td><td>74<t< td=""><td>0.8<t< td=""></t<></td></t<></td></t<></td></t<>	<i>L></i>	1>	۳.	0.96	1.60	21	;	145	2 <t< td=""><td>킈</td><td>74<t< td=""><td>0.8<t< td=""></t<></td></t<></td></t<>	킈	74 <t< td=""><td>0.8<t< td=""></t<></td></t<>	0.8 <t< td=""></t<>
No. 1		=	=	=	Aug. 22	16.9	9.03	1.29	3.5	17	94	9	0.96	1.30	36	6	170	7 <t< td=""><td>2.2</td><td>67<t< td=""><td>0.5<w< td=""></w<></td></t<></td></t<>	2.2	67 <t< td=""><td>0.5<w< td=""></w<></td></t<>	0.5 <w< td=""></w<>
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10		2	=	r	Aug. 24	16.4	7.97	99.0	3.1	52	20	9	970	1.60	77	_	170	5 <t< td=""><td><u>%</u> </td><td>65<t< td=""><td>0.5<w< td=""></w<></td></t<></td></t<>	<u>%</u>	65 <t< td=""><td>0.5<w< td=""></w<></td></t<>	0.5 <w< td=""></w<>
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1		\$	=		Aug. 24	;	8 01	0.84	1.6 <t< td=""><td>7</td><td>ব</td><td>7</td><td>0.96</td><td>1.40</td><td>22</td><td>1</td><td>130</td><td>1/</td><td>;</td><td>29<t< td=""><td>0.5<w< td=""></w<></td></t<></td></t<>	7	ব	7	0.96	1.40	22	1	130	1 /	;	29 <t< td=""><td>0.5<w< td=""></w<></td></t<>	0.5 <w< td=""></w<>
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1.	(†	100	150	0.5	June 27	;	7.56	1.73	1.3 <t< td=""><td>>3000</td><td>>3000</td><td>222</td><td>124.0</td><td>4 80</td><td>758</td><td>1</td><td>1140</td><td>શ</td><td>T>90</td><td>7>7e</td><td>2.9</td></t<>	>3000	>3000	222	124.0	4 80	758	1	1140	શ	T>90	7>7e	2.9
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360 143 746 1350 1800 150 740 1900 20 2970 25 3404 108 210 20 <td></td> <td>2</td> <td>**</td> <td>2</td> <td>Aug. 22</td> <td>17.0</td> <td>17.71</td> <td>2.20</td> <td>4.9</td> <td>19000</td> <td>00091</td> <td>320</td> <td>112.0</td> <td>3.10</td> <td>614</td> <td>9</td> <td>1010</td> <td>۵I</td> <td>3.0</td> <td>130</td> <td>2.5<t< td=""></t<></td>		2	**	2	Aug. 22	17.0	17.71	2.20	4.9	19000	00091	320	112.0	3.10	614	9	1010	۵I	3.0	130	2.5 <t< td=""></t<>
360 140 0.5 June 20		5	200	0.5	Aug. 23	17.8	7.65	1.35	₽ <u>`</u> †	3200	008	12	142.0	7.40	1900	20	2970	81	9.0	011	1.9 <t< td=""></t<>
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Thing 25		: 3	160	0.5	June 27		7.84	1.94	1961	7 60	÷ ;	7 5	96.0	05.01	9/	:	200	97	0.9<	100<1	1.1<
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1.5 Aug. 23 17.3 7.97 3.70 4.7 148 112 22 99.0 1.80 80 3 250 13 1.6 130 300 1.0 Aug. 23 17.2 7.88 2.30 4.1 140 80 12 103.0 2.20 198 6 380 16 7.1 3.0 Aug. 24 16.6 7.81 1.27 2.9 44 24 6 111.0 3.15 543 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1.0 3.15 540 17 740 26 99.9 1 1		z	=	5		15.9	7.72	1.47	2.4 <t< td=""><td>48</td><td>91</td><td>2</td><td>106.0</td><td>2.50</td><td>342</td><td>٣.</td><td>240</td><td>61</td><td>파</td><td>99<t< td=""><td>1.7<t< td=""></t<></td></t<></td></t<>	48	91	2	106.0	2.50	342	٣.	240	61	파	99 <t< td=""><td>1.7<t< td=""></t<></td></t<>	1.7 <t< td=""></t<>
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		2	=	3.0		16.9	7.93	2.20	5.2	89	120	2	0.86	1.70	76	2	260	14	% 	150	2.1 <t< td=""></t<>

		Zinc	Hg.I.	- X	0.7 <t< th=""><th>T>9.1</th><th>0.7<t< th=""><th>3.4</th><th>2.2</th><th>2.8</th><th>0.8<t< th=""><th>3.5</th><th>1.4.1</th><th>12.0</th><th>I.I<t< th=""><th>2.9</th><th>2.8</th><th>1.6<t< th=""><th>4. c</th><th>1.8<t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	T>9.1	0.7 <t< th=""><th>3.4</th><th>2.2</th><th>2.8</th><th>0.8<t< th=""><th>3.5</th><th>1.4.1</th><th>12.0</th><th>I.I<t< th=""><th>2.9</th><th>2.8</th><th>1.6<t< th=""><th>4. c</th><th>1.8<t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	3.4	2.2	2.8	0.8 <t< th=""><th>3.5</th><th>1.4.1</th><th>12.0</th><th>I.I<t< th=""><th>2.9</th><th>2.8</th><th>1.6<t< th=""><th>4. c</th><th>1.8<t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	3.5	1.4.1	12.0	I.I <t< th=""><th>2.9</th><th>2.8</th><th>1.6<t< th=""><th>4. c</th><th>1.8<t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	2.9	2.8	1.6 <t< th=""><th>4. c</th><th>1.8<t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	4. c	1.8 <t< th=""><th>T>6.1</th><th>1.5<t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<></th></t<>	T>6.1	1.5 <t< th=""><th>2.0<t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<></th></t<>	2.0 <t< th=""><th>T>6.1</th><th>0.7ZT</th><th>1.3<t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<></th></t<>	T>6.1	0.7ZT	1.3 <t< th=""><th>0.8<t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<></th></t<>	0.8 <t< th=""><th>0.5<w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< th=""><th>2.3<t< th=""><th>T>!!</th><th>1541</th><th>1.0<1 T/5 C</th><th>2.6</th><th>2,3<t< th=""><th>1.0<t< th=""><th>1.3<t< th=""><th>1.4<t< th=""><th>1.4<t< th=""><th>1.5<1</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></w<></th></t<>	0.5 <w< th=""><th>0.8<t< th=""><th>0.6<t< th=""><th>1.7<t< 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		Iron	700	135	62 <t< td=""><td>134</td><td>T>79</td><td>220</td><td>170</td><td>222</td><td>74<t< td=""><td>250</td><td>C21</td><td>1200</td><td>85<t< td=""><td>180</td><td>061</td><td>130</td><td>0/1</td><td>061</td><td>160</td><td>85<t< td=""><td>175</td><td>175</td><td>110 55/T</td><td>120</td><td>T>69</td><td>56<t< td=""><td>70<t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	134	T>79	220	170	222	74 <t< td=""><td>250</td><td>C21</td><td>1200</td><td>85<t< td=""><td>180</td><td>061</td><td>130</td><td>0/1</td><td>061</td><td>160</td><td>85<t< td=""><td>175</td><td>175</td><td>110 55/T</td><td>120</td><td>T>69</td><td>56<t< td=""><td>70<t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	250	C21	1200	85 <t< td=""><td>180</td><td>061</td><td>130</td><td>0/1</td><td>061</td><td>160</td><td>85<t< td=""><td>175</td><td>175</td><td>110 55/T</td><td>120</td><td>T>69</td><td>56<t< td=""><td>70<t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	180	061	130	0/1	061	160	85 <t< td=""><td>175</td><td>175</td><td>110 55/T</td><td>120</td><td>T>69</td><td>56<t< td=""><td>70<t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	175	175	110 55/T	120	T>69	56 <t< td=""><td>70<t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	70 <t< td=""><td>86<t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<></td></t<>	86 <t< td=""><td>84<t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<></td></t<>	84 <t< td=""><td>200</td><td>94<t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<></td></t<>	200	94 <t< td=""><td>130</td><td>C. 2</td><td>071</td><td>130</td><td>7>8e</td><td>105</td><td>79<t< td=""><td>120</td><td>0+1</td><td></td></t<></td></t<>	130	C. 2	071	130	7>8e	105	79 <t< td=""><td>120</td><td>0+1</td><td></td></t<>	120	0+1	
		Phenolics	1.8.1-,		0.6 <t< td=""><td>1,4</td><td>1.2</td><td>9.6</td><td>9]</td><td><u> </u></td><td>11</td><td>5.0</td><td><u> </u></td><td>) <u>-</u></td><td>0.6<t< td=""><td>1.0</td><td>9]</td><td>2]</td><td>916</td><td>200</td><td> <u>~</u></td><td>27</td><td>10</td><td>건)</td><td><u>e</u>] ~</td><td>16.2</td><td>8.</td><td>2.2</td><td><u>∞</u>]</td><td>2.2</td><td>0.1</td><td><u>~]</u></td><td><u>9</u>]</td><td><u> </u></td><td>1'</td><td>12</td><td>3.2</td><td>0.4<t< td=""><td>2.0</td><td>즤</td><td>0.1</td><td>c>1</td><td></td></t<></td></t<></td></t<>	1,4	1.2	9.6	9]	<u> </u>	1 1	5.0	<u> </u>) <u>-</u>	0.6 <t< td=""><td>1.0</td><td>9]</td><td>2]</td><td>916</td><td>200</td><td> <u>~</u></td><td>27</td><td>10</td><td>건)</td><td><u>e</u>] ~</td><td>16.2</td><td>8.</td><td>2.2</td><td><u>∞</u>]</td><td>2.2</td><td>0.1</td><td><u>~]</u></td><td><u>9</u>]</td><td><u> </u></td><td>1'</td><td>12</td><td>3.2</td><td>0.4<t< td=""><td>2.0</td><td>즤</td><td>0.1</td><td>c>1</td><td></td></t<></td></t<>	1.0	9]	2]	916	200	<u>~</u>	27	10	건)	<u>e</u>] ~	16.2	8.	2.2	<u>∞</u>]	2.2	0.1	<u>~]</u>	<u>9</u>]	<u> </u>	1'	12	3.2	0.4 <t< td=""><td>2.0</td><td>즤</td><td>0.1</td><td>c>1</td><td></td></t<>	2.0	즤	0.1	c>1	
		¥.	HB.F.	77		12	4 <t< th=""><th>17</th><th>37</th><th>위</th><th>4<t< th=""><th>17</th><th>2.5</th><th>36</th><th>χĮ</th><th>91</th><th>찌</th><th>23</th><th>S] :</th><th>8 0</th><th>? =</th><th>10</th><th>24</th><th>9<t< th=""><th>1 \</th><th>01</th><th>0<t< th=""><th>4<t< th=""><th>4<t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	17	37	위	4 <t< th=""><th>17</th><th>2.5</th><th>36</th><th>χĮ</th><th>91</th><th>찌</th><th>23</th><th>S] :</th><th>8 0</th><th>? =</th><th>10</th><th>24</th><th>9<t< th=""><th>1 \</th><th>01</th><th>0<t< th=""><th>4<t< th=""><th>4<t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	17	2.5	36	χĮ	91	찌	23	S] :	8 0	? =	10	24	9 <t< th=""><th>1 \</th><th>01</th><th>0<t< th=""><th>4<t< th=""><th>4<t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	1 \	01	0 <t< th=""><th>4<t< th=""><th>4<t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	4 <t< th=""><th>4<t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	4 <t< th=""><th>4<t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<></th></t<>	4 <t< th=""><th>145</th><th>17</th><th>2<t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<></th></t<>	145	17	2 <t< th=""><th>9<t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<></th></t<>	9 <t< th=""><th>77</th><th>2 9</th><th>28</th><th>8<t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<></th></t<>	77	2 9	28	8 <t< th=""><th>D>6</th><th>9<t< th=""><th>12</th><th>24</th><th></th></t<></th></t<>	D>6	9 <t< th=""><th>12</th><th>24</th><th></th></t<>	12	24	
		Total Kjeldahl N	μg.1'	103	165	220	160	250	950	552	160	270	057	077	061	260	730	580	0991	280	220	250	305	205	017	290	180	160	150	150	2200	260	210	210	270	026	280	200	238	245	250	530	1
		Un-ionized Ammonia	µg.l.	0.3	; ;	2	1	2	:	0.2	1	7	<i>~</i> (7 1	:	2	1	;	1 6	7 0	-	-	:	2	- 5	4. 4	-	_	-	_	;	2	2	2	1	۱ ر	a ;	ł	2	33	2	;	
		Am	μg.I.	34	<u> </u>	56	91	78	588	15	22	74	20 t	414	7 7	08	961	308	1220	23	70	84	39	70	98	30	07	36	38	36	208	89	89	99	245	/ 57	334	36	7.1	102	92	256	
Parameter		Chloride	mg.l.	7.7	1.6	1.50	1.50	1.50	4.10	1.80	1.60	1.60	1.60	3.10	1.80	1.50	3.50	2.60	7.40	05.1	1.60	1.60	1.90	1.60	09.1	1.30	1.60	1.40	1.40	1.40	3.20	1.50	1.60	1.70	3.20	3.10	3.60	1.80	1.50	1.70	1.70	3.1	
Para		Conductivity	.s.cm. @25°C	76	6 %	97.0	96.0	97.0	0.811	0.86	0.96	97.0	0.66	98.5	96.0	0.86	112.0	0.111	147.0	0.79	98.0	0.66	0.66	0.86	98.0	0.76	97.0	0.79	0 96	97.0	0.601	97.0	0.86	97.0	105.0	0.501	0.111	97.0	0.86	0.66	0.86	107	
		37	٥																											01	9	9	~	ক	w (7> -	2 -3	<2>	33	6	2	ব	
		Escherichia coli	org.dl ⁻¹	₹ .	→ √) (1	}]≘	148	7	₹	₹	128	7 8	87	2 7	136	 	12	80	의 3	5 3	28	₹	26	9 ;	3, 26	2.09	32	91	48	52	80	98	89	۲ :	97	25 25	12	588	19	99	4	
		Fecal	org.dl.	₹ .	+ 7	678	<u> </u> 9	192	89	9>	₹	쾰	<u>2</u> 2	49	7 7	212	72	20	희	[33	<u>₹</u> ≎	7	1>	46	52	25	6 42	72	24	89	89	128	96	92	70	61	S = 8	13	887	12	128	36	
		Su	mg.l.	2.6	2.5 T/5.0	3.6	1.5CT	8.0	3.5	5.6	1.7 <t< td=""><td>7.2</td><td>2.8</td><td>2.0<t< td=""><td>7.1.5</td><td>7.2</td><td>4.8</td><td>2.9</td><td>4.2</td><td>6.9</td><td>1.0<1</td><td>T>6.1</td><td>1.2<t< td=""><td>3.4</td><td>3.5</td><td>0.5<w< td=""><td>+;; <u>-</u></td><td>0.3<w< td=""><td>2.3<t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<></td></w<></td></t<></td></t<></td></t<>	7.2	2.8	2.0 <t< td=""><td>7.1.5</td><td>7.2</td><td>4.8</td><td>2.9</td><td>4.2</td><td>6.9</td><td>1.0<1</td><td>T>6.1</td><td>1.2<t< td=""><td>3.4</td><td>3.5</td><td>0.5<w< td=""><td>+;; <u>-</u></td><td>0.3<w< td=""><td>2.3<t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<></td></w<></td></t<></td></t<>	7.1.5	7.2	4.8	2.9	4.2	6.9	1.0<1	T>6.1	1.2 <t< td=""><td>3.4</td><td>3.5</td><td>0.5<w< td=""><td>+;; <u>-</u></td><td>0.3<w< td=""><td>2.3<t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<></td></w<></td></t<>	3.4	3.5	0.5 <w< td=""><td>+;; <u>-</u></td><td>0.3<w< td=""><td>2.3<t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<></td></w<>	+;; <u>-</u>	0.3 <w< td=""><td>2.3<t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<>	2.3 <t< td=""><td>0.4<w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<></td></t<>	0.4 <w< td=""><td>26.9</td><td>4.7</td><td>1.8<t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<></td></w<>	26.9	4.7	1.8 <t< td=""><td>3.9</td><td>0.9<t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<></td></t<>	3.9	0.9 <t< td=""><td>3.0</td><td>0.0</td><td>1.6<t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<></td></t<>	3.0	0.0	1.6 <t< td=""><td>3.1</td><td>1.3<t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<></td></t<>	3.1	1.3 <t< td=""><td>5.3</td><td>T>9.1</td><td>1</td></t<>	5.3	T>9.1	1
		Turbidity	FTU	7	1.71	06	1 19	3.40	2.50	3,37	1.24	3.40	2.80	1.16	1.80	2.10	2.60	1.51	2.10	3.10	4.40	2.30	1.59	1.33	1.23	1.25	1.06	1.15	1.45	1.15	6.50	1.00	2.70	1.34	1.55	1 26	1 80	1.42	1.08	1.47	16.1	2	
		re pH		7.92	7.88	2 80	7 98	7.86	7.60	7.81	7.95	7.88	7.93	7.95	7.07	7.90	7.60	7.59	7.53	7.91	7.98	79.7	7.95	7.94	7.96	20.8	8.01	8.04	7.98	8 04	7.49	7.93	7.99	7.88	7.87	7.74	27.7	7.88	7.96	7.96	7.92	7.91	
		Temperature	Ç.	10.8	;	16.6	0.01	16.9	1	10.8	1	17.0	16.8	16.2	1	17.0	1	;	1	17.0	16.9	16.9	;	16.4	16.6	16.9	16.7	16.8	16.7	16.7	1	16.9	16.7	16.3	1	1 3	0.01	1	16.8	16.7	16.3	1	
	Sampling	Date		June 28	June 27	4.10 22	Aug 22	Ano 22	June 27	June 28	June 29	Aug. 22	Aug. 23	Aug. 24	June 27	Aug 22	June 27	June 27	June 29	Aug 22	Aug. 23	Aug. 23	June 28	Aug. 24	Aug. 24		Aug 24			Aug. 23	June 29	Aug. 22	Aug. 23	Aug. 24	June 27	June 29	Aug. 22	June 29	Aug. 22	Aug. 23	Aug. 24	June 27	
	Sample	Depth metres		0.5	0.5	-	0	3 =	10	0.5	3	Ξ	:	0.5	0.1		1.0	0.5	=	= (0.5	0.5	1.0	2	4 0	0.1	0.17	2.0	ž	8.0	0.5	=	=	2	0.8	0.5	0 7	5.0	=	39	2	1.0	
ונו	Distance in metres from	CDN. shore		100	160	z	100	100	2	200	=	=	2	200	= 6	077	*	240	2	3 1	250	300	2	2	=	350	2	400	=	:	150	=	:	3	ä	175	z	200	=	٤	2	=	
Station	Distance	WWTP 0		200	3 3	: 3	: :	:	:	3	3	3	3	3	: :	: 3	3	:	*	:	: :	3	3	*	3	: :	: :	3	7	*	006	3	3	3	:	3 ;	: :	2	:	3	:	:	1
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The continue between the con																					
This continue Decision Deci		Distance	in metres	Sample	Sampling																
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*** *** <td></td> <td>3</td> <td>=</td> <td>=</td> <td>Aug. 22</td> <td>16.8</td> <td>7.90</td> <td>1.06</td> <td>3.9</td> <td>1210</td> <td>880</td> <td>12</td> <td>0.86</td> <td>1.60</td> <td>87</td> <td>3</td> <td>255</td> <td>12</td> <td><u>'</u></td> <td>145</td> <td>1.4<t< td=""></t<></td>		3	=	=	Aug. 22	16.8	7.90	1.06	3.9	1210	880	12	0.86	1.60	87	3	255	12	<u>'</u>	145	1.4 <t< td=""></t<>
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1,5 June 27 June	:	:	=	:		16.6	7.94	0.70	1.5 <t< td=""><td>32</td><td>24</td><td>2</td><td>0.96</td><td>1 40</td><td>20</td><td>_</td><td>0+1</td><td>T>†</td><td>컨</td><td>30<1</td><td>0.5<w< td=""></w<></td></t<>	32	24	2	0.96	1 40	20	_	0+1	T>†	컨	30<1	0.5 <w< td=""></w<>
10	:	2	2	1.5	June 27	;	7.85	06.0	1.3 <t< td=""><td>∞</td><td>∞</td><td>7</td><td>95.0</td><td>1.60</td><td>18</td><td>:</td><td>150</td><td>D>9</td><td>D>9.0</td><td>1995</td><td>0.9<1</td></t<>	∞	∞	7	95.0	1.60	18	:	150	D>9	D>9.0	1995	0.9<1
280 2.5 June 27 - 7.91 1.30 0.84T 20 20 4 96.0 1.10 26 - 180 8cT 504T																				!	6
320 10 Aug 23 170 792 074 2347 492 238 14 970 145 41 1 160 041 16 16	L (54)	4700	280	2.5	June 27	:	7.91	1.30	0.8 <t< td=""><td>20</td><td>20</td><td>4</td><td>0.96</td><td>1.10</td><td>56</td><td>,</td><td>180</td><td>1≫.</td><td>0 8<t< td=""><td>50<1</td><td>1>7:1</td></t<></td></t<>	20	20	4	0.96	1.10	56	,	180	1≫.	0 8 <t< td=""><td>50<1</td><td>1>7:1</td></t<>	50<1	1>7:1
1. 1, 10, 10, 10, 10, 10, 10, 10, 10, 10,	; :	:	320	1.0	Aug. 22	17.0	7.92	0.74	2.3 <t< td=""><td>492</td><td>띪</td><td>12</td><td>97.0</td><td>1.45</td><td>41</td><td>→</td><td>160</td><td>1>9</td><td>의:</td><td>1001</td><td>1>8<0</td></t<>	492	띪	12	97.0	1.45	41	→	160	1>9	의:	1001	1>8<0
" Aug 24 16.6 7.81 1.04 2.7 44 2.4 2.9 160 58 2 210 741 191 0.4 " S0 Aug 24 16.5 7.97 1.88 3.4 1.26 9.8 1.50 6.2 2 2.00 747 1.8 8.1 1.40 1.00 5.2 2.00 747 1.8 8.1 1.40 1.00 5.2 2.00 747 1.8 8.1 1.40 1.00 5.2 2.00 747 1.8 8.1 1.40 1.00 5.2 2.00 747 1.8 8.1 1.40 1.00 5.2 2.00 747 1.42 1.40 1.00 1.00 5.2 2.00 747 1.47 1.40 1.00 1.00 5.2 2.00 747 1.47 1.40 1.00 1.00 5.2 2.00 747 1.47 1.40 1.00 1.00 1.00 1.00 1.00 1.00 1.00	:	3	:	=	Aug. 23	16.6	7.92	1.63	5.6	<u> 586</u>	<u>8778</u>	†	97.0	1.50	64	7	200	= ;	<u>* </u>	1>1	1>6.0
** \$ 0.00	:	:	Ξ	:	Aug. 24	16.6	7.81	1.04	2.7	7	24	7	0.86	09.1	28	7	210	/< I	라:	1>60	W.5C.U
400 1.5 Aug. 24 16.4 7.83 1.29 3.4 156 96 4 98.0 160 552 2 200 7c1 0 25 8147 2.0 Aug. 25 170 7.96 1.08 2.6 198 2.6 198 2.2 10 8.0 1.40 4.0 1.40 4.0 1 1 160 6c1 0 8c7 1 16 8 1c7 2.0 Aug. 25 170 7.96 1.08 2.6 196 1.52 3.2 95.0 1.00 32 2 2 200 7c1 1.6 81c1 2.0 Aug. 25 1.6 7.99 2.00 0.3cW 2.1 Aug. 25 1.6 8.03 0.80 0.3cW 2.2 1.0 1.0 32 - 170 6c7 5c7 5c7 1.0 140 2.2 2.0 1.0 32 - 170 6c7 5c7 5c7 1.0 140 2.2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	:	2	:	5.0	Aug. 23	16.5	7.97	1.88	3.7	272	<u>220</u>	∞	0.86	1 50	62	7	220	1 %	<u> </u>	0+1 L-10	1.22.1 T>4.0
2.0 Aug. 22 17.0 7.96 1.08 2.6 780 428 6.2 97.0 1.40 4.0 1.0 1.40 4.0 1.0 1.40 4.0 1.0 1.6	:	ī	400	1.5	Aug. 24	16.4	7.83	1.29	3.4	156	96	-, '	0.86	097	25	7 -	700	151 F-7	12	7.17	T>8.0
Substitute Sub	:	Ŧ	:	2.0	Aug. 22	17.0	7.96	1.08	2.6	<u></u>	8715	2 5	0.76	04.1	0+	- <i>(</i>	2002	- L/-	1 9 1	XI<	1.0cT
S.O. June 27	2	*		=	Aug. 23	16.4	7.99	2.00	0.7.0	<u>s</u> ;	7일~	۲. ر. د	96.0	001	70 62	4 {	027	6 <t< th=""><th>1 >9 O</th><th>54<t< th=""><th>D.6<t< th=""></t<></th></t<></th></t<>	1 >9 O	54 <t< th=""><th>D.6<t< th=""></t<></th></t<>	D.6 <t< th=""></t<>
6.50 Aug. 2.5 16.5 1.98 1.49 5.7	:	3	= :	5.0	June 27	1 \	7.95	06.0	0.3 <w< th=""><th>+7 140</th><th>01</th><th>7 4</th><th>98.0</th><th>1.50</th><th>1 00</th><th>, ,</th><th>061</th><th>12</th><th>1.0</th><th>140</th><th>1.2<t< th=""></t<></th></w<>	+7 140	01	7 4	98.0	1.50	1 00	, ,	061	12	1.0	140	1.2 <t< th=""></t<>
650 1.5 Aug. 25 16.5 6.03 0.00 0.54 1 0.0 1.2	:	:		0.8	Aug. 23	10.3	06.7	1.43	7.7 T. 30		1=	2 -	0.07	1 30	0 00	. –	140	3 <t< th=""><th>1 0<t< th=""><th>36<t< th=""><th>0.5<w< th=""></w<></th></t<></th></t<></th></t<>	1 0 <t< th=""><th>36<t< th=""><th>0.5<w< th=""></w<></th></t<></th></t<>	36 <t< th=""><th>0.5<w< th=""></w<></th></t<>	0.5 <w< th=""></w<>
" 3.5 Aug. 24 10.1 1.2 2.5 36 8 96.0 1.30 24 1 130 4 <t 1.2="" 70<="" 70<t="" th=""><th>: :</th><th>: :</th><th>059</th><th><u></u></th><th>Aug. 23</th><th>16.5</th><th>20.0</th><th>0.00</th><th>26</th><th>3 7</th><th>, « «</th><th>7</th><th>0.96</th><th>07</th><th>22</th><th>-</th><th>150</th><th>4<t< th=""><th>7.6</th><th>39<t< th=""><th>0.5<w< th=""></w<></th></t<></th></t<></th></t>	: :	: :	059	<u></u>	Aug. 23	16.5	20.0	0.00	26	3 7	, « «	7	0.96	07	22	-	150	4 <t< th=""><th>7.6</th><th>39<t< th=""><th>0.5<w< th=""></w<></th></t<></th></t<>	7.6	39 <t< th=""><th>0.5<w< th=""></w<></th></t<>	0.5 <w< th=""></w<>
## 5.5 Aug. 25 16.5	: :		2	,	Aug. 24	15.0	000	1001	, ,	32	3.6	- 00	96.0	1.30	24	-	130	T>+	12	70 <t< th=""><th>0.5<w< th=""></w<></th></t<>	0.5 <w< th=""></w<>
" 6.5 Aug. 23 16.5 8.03 1.15 2.0¢T 38 28 8 96.0 1.30 28 1 155 5¢T 1.1¢T 68¢T 1.1¢T 68¢T 2.0¢T 2.0¢T 3.0¢T 3.		:	=	9 5	1.00 27	0,0	7 04	00.1		17	3 4	\$	95.0	1.20	20	;	160	8 <t< th=""><th>T>9.0</th><th>48<t< th=""><th>0.9<t< th=""></t<></th></t<></th></t<>	T>9.0	48 <t< th=""><th>0.9<t< th=""></t<></th></t<>	0.9 <t< th=""></t<>
0.2 Aug. 23 10.3 0.05 1.15 2.05 1 1.0 0.20 2 20 2 0.2 10 56.5 200 100 20 2 0.2 10 300 300 300		3		j (7 Julic 6.7	3 71	0 02	1.15	7-0-0	00	28	· «	96.0	1.30	28	-	155	5 <t< th=""><th>1.1<t< th=""><th>T>89</th><th>0.5<w< th=""></w<></th></t<></th></t<>	1.1 <t< th=""><th>T>89</th><th>0.5<w< th=""></w<></th></t<>	T>89	0.5 <w< th=""></w<>
	:	:		0.0		10.3	0.0	<u> </u>	70.7	5	3)) :							
>6.5 30	Minimum R.	V elderone	aline				00.0	0.05	0.3	:		:	1.0	0.20	2	:	20	7	0.2	01	0.5
	PWQ Object	rve/Guideli	ne			:	>6.5-	:	;	(100)	100	;	1	;	:	20	1	30	_	300	30
							<. 5.8.5							1	1	ı	1	1	1	300	30
	GLWQA OF	jective				:	<6.5-	:	:	ı	1	1	I	1	1	l	1				

d PWQ (OMOE, 1984) or G

NOTES

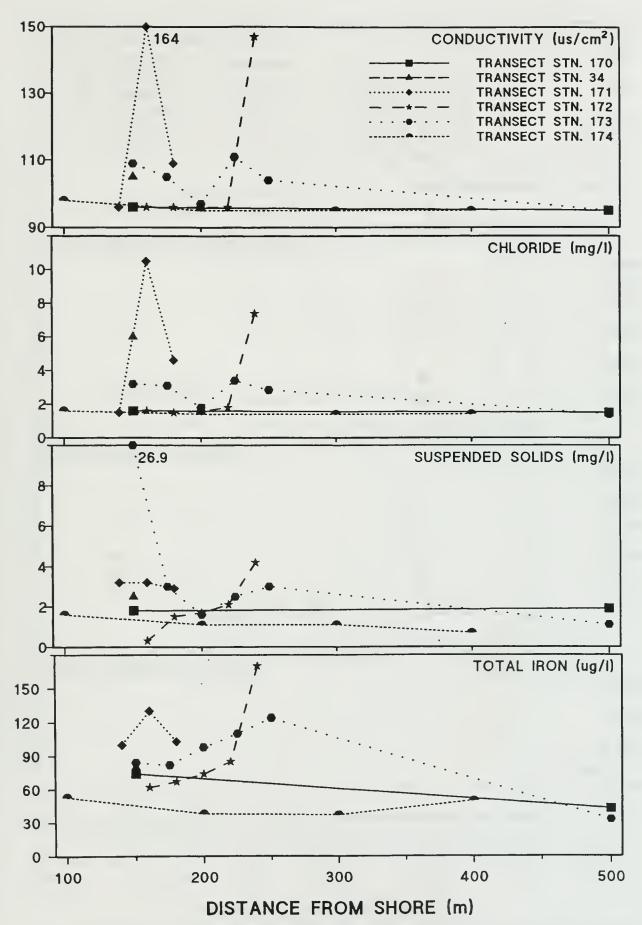


Figure 9. Cross-sectional distribution of conductivity, chloride, suspended solids and iron in Lake George Channel surface waters on June 29, 1989.

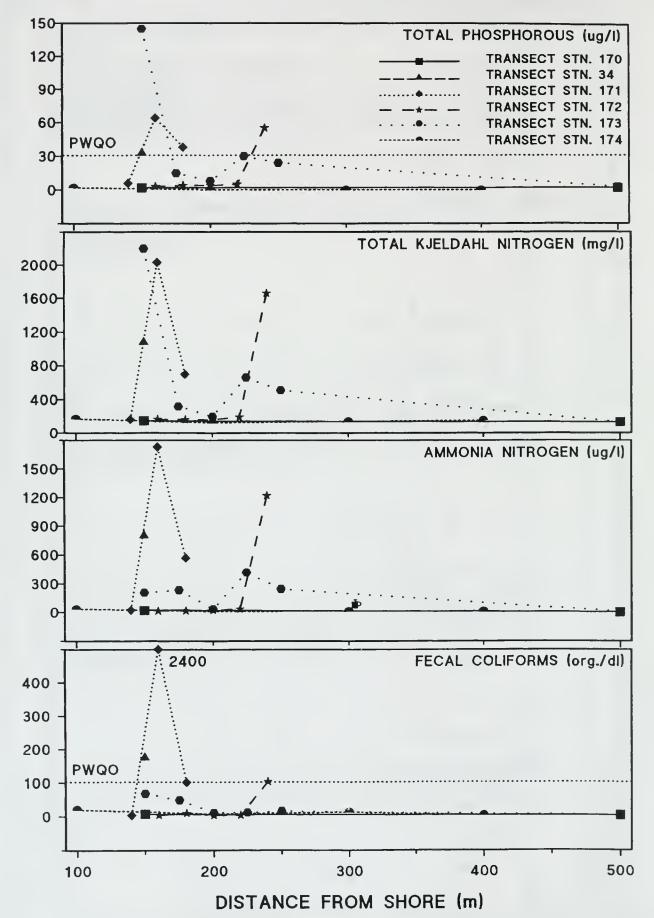


Figure 10. Cross-sectional distribution of total phosphorus, total Kjeldahl nitrogen, ammonia nitrogen and fecal coliform bacteria in Lake George Channel surface waters on June 29, 1989.

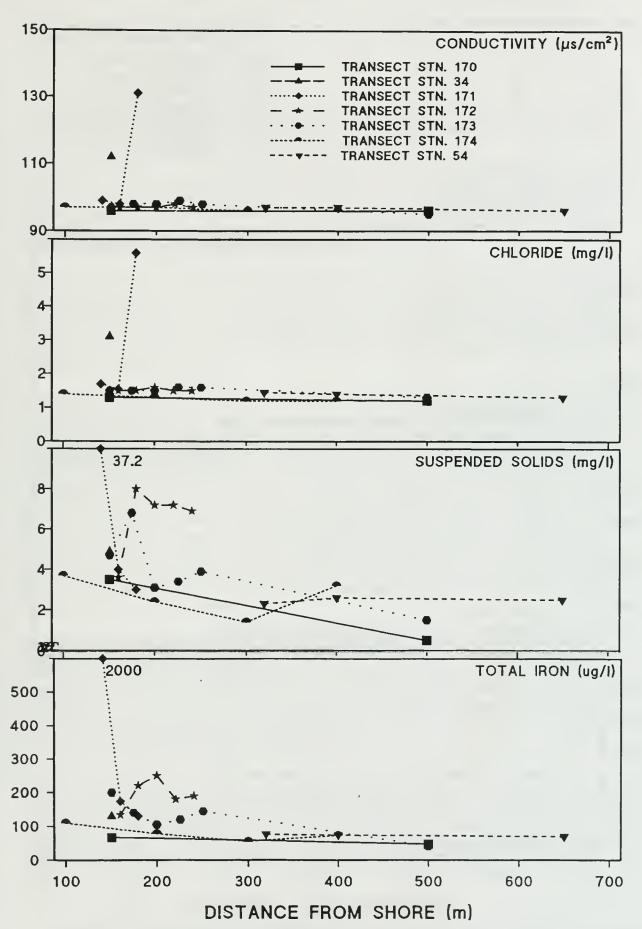


Figure 11. Cross-sectional distribution of conductivity, chloride, suspended solids and iron in Lake George Channel surface waters on August 22, 1989.

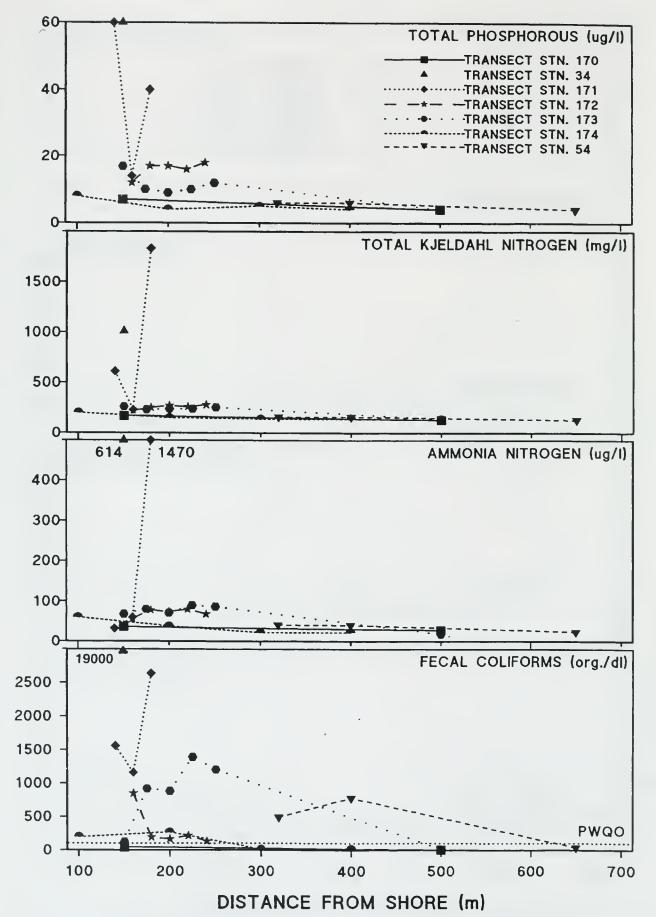


Figure 12. Cross-sectional distribution of total phosphorus, total Kjeldahl nitrogen, ammonia nitrogen and fecal coliform bacteria in Lake George Channel surface waters on August 22, 1989.

5.2.4 Surficial Sediment Quality

Visual descriptions indicate that surficial (upper 3 cm) sediments collected in the Lake George Channel and in Little Lake George were generally very organic in nature (i.e., "oozy"), often with a sewage or oily odour. All samples had an oily sheen (Table 5).

Particle size distribution analysis showed that sediments at a high proportion of the stations were of a sandy-silt or silty-sand composition, and sediments from the inshore stations in the Lake George Channel usually had more than 50% of their particle size distribution in the silt-clay (<62 µm diameter) fraction. Samples from further offshore, where the current is somewhat greater, often had somewhat less silt-clay content (Table 5; Fig. 13).

Analysis of samples for bacteria was complicated by the need for dilution, and this raised the detection limits for organisms. In general, however, sediments from up to 2 km downstream of the WWTP discharge (as far as Transect I/Station 176) contained elevated densities (relative to Transect B) of fecal coliform, *E. coli* and faecal *Streptococcus* bacteria. Densities of these organisms reached as high as about 134,000, 14,400 and 21,000 organisms per kg of wet sediment, respectively (Table 6).

Concentrations of nutrients and persistent inorganic contaminants (e.g., heavy metals) usually increased downstream of the WWTP discharge (compare stations on Transects C and E in Table 7 and Figs. 13 and 14). Also, concentrations were often higher at inshore stations than at offshore stations. Correlation analysis (Appendix Table A-9) indicated that concentrations of arsenic, cyanide, heavy metals and many of the individual PAH compounds correlated significantly (p < 0.05) with one another r = 0.50 to 1.0), suggesting a common (i.e., upstream) source. Sediment moisture content and loss on ignition (LOI) also correlated significantly with many of these contaminants. In contrast, the proportion of silt and clay (i.e., "fines") in sediments or of TOC content correlated significantly with only a few of the persistent contaminants (arsenic, cyanide, cadmium) and with total Kjeldahl nitrogen or total phosphorus. Solvent extractable (oils and greases) levels only correlated significantly with TOC content. Consequently, concentrations of the persistent contaminants plotted in Figures 13 and 14 were not normalized to TOC or percent fines.

Concentrations of many of the contaminants exceeded sediment quality guidelines for the protection of benthic organisms (Persaud *et al.*, 1993) at a number of the sampling locations. Stations with a large number of parameters exceeding these guidelines included those on Transects C, E, F, G, H, L (Stations 34, 172, 173, 175, 174 and 54) in Lake George Channel and Station 87 in Little Lake George, as well as the upstream reference, Transect B (Station 170). This indicates that upstream sources contribute or have contributed to sediment quality problems in the Lake George Channel and in Little Lake George.

Some of the samples from the stations noted in the previous paragraph also contained concentrations exceeding the Provincial Sediment Quality Guidelines "Lowest Effect Level" (LEL) for arsenic (6 mg.kg⁻¹, or ppm), cadmium (0.60 mg.kg⁻¹), chromium (26 mg.kg⁻¹), copper (16 mg.kg⁻¹), iron (20,000 mg.kg⁻¹), lead (31 mg.kg⁻¹), manganese (460 mg.kg⁻¹), mercury (0.2 mg.kg⁻¹), nickel (16 mg.kg⁻¹) and zinc (120 mg.kg⁻¹). In addition, concentrations of available cyanide at these stations exceeded the Provincial guideline of 0.1 mg.kg⁻¹ for Open Water

Table 5. Characteristics of Lake George Channel and Little Lake George surficial sediments.

S	Station		Visual & Olfa	factory Description				Particle Size Distribution	lon		
Transect	Metres from	Type	Plants?	Detritus?	Oily?	Odour	Coarse Sand (2000- 1000 μm)	Sand (999-63 µm)	Silt & Clay (< 62 µm)	Molsture	Density
(raning)							%	20	%	%	g.cm³
F (170)	150	OOZe	>		√ (verv)	sewage	0.10	74.60	25.18	38.0	1.521
	200	9Z00	>		`>	faint	0.30	15.00	84.17	78.0	1.433
C (34)	150	ooze over sandy layer				slight sewage	0.20	70.90	28.71	43.0	1.457
E (172)	150	ooze over sandy layer black ooze	>	>>	√ (very) √ (very)	slight sewage oily	0.10	44.27 69.25	55.35 30.35	42.3	1.283 ± 0.050 1.264 ± 0.015
F(173)	100	ooze over red-brown layer ooze over some sand	>	>	√ (very) √ (very)	slight	0.10	37.30 78.00	62.20 21.43	39.0	1.253
G (175)	50 .	black ooze ooze	√ √ (Cladophora)	>>	/ (very)	moderate sewage oily	0.10	31.20	65.40 39.10	0.09	1.238 ± 0.006 1.309
(177)	20	silty sand & ooze		√ (wood fibre)	>		0,40	46.50	52.71	45.0	1.400
(178)	0	ooze & sandy gravel	√ (Cladophora)		>	oily	2.30	51.90	45.55	30.0	1.577
H (174)	50 100	black ooze ooze & some sand		>>	√ (very) √ (very)	slight slight	010	41 40 58.00	58.50 41.65	61.0	1.223 1.318 ± 0.028
1 (176)	10	ooze & sand	>		/ (quite)		0:30	78.60	20.94	32.0	1,574
L (54)	320	błack ooze	>	>	√ (very)	oily	030	21 60	78 00	74 0	1.143
(87)	400	organic ooze		>	>	slightly oily	0.10	31 10	68.58	58.0	1,313
MRV		:	1	ŀ	:	1	0.10	0.10	0.10	;	1

NOTES: "/= present.

Table 6. Bacterial densities in Lake George Channel and Little Lake George surficial sediments.

S	Station		Bacterial Density	,
Transect (Number)	Metres from Canadian shore	Fecal coliforms	Escherichia coli	Fecal Streptococcus
		number.kg ⁻¹	number.kg ⁻¹	number.kg ⁻¹
B (170)	150	<10000	<10000	<10000
	500	<10000	<10000	<10000
C (34)	150	<10000	<10000	<10000
E (172)	150	<10000	<10000	<10000
	300	~14142	~10000	<100000
E (172)	100	20000	20000	-100000
F (173)	100 300	~30000	~20000 ~20000	<100000 <10000
	300	~60000	~20000	<10000
G (175)	50	~10000	<10000	<100000
	150	~10000	~10000	<100000
(177)	20	~10000	<10000	<10000
(178)	0	~60000	~60000	<100000
H (174)	50	~30000	<10000	<10000
	100	~133887	~14422	<21544
1 (176)	10	~70000	~10000	<10000
L (54)	320	<10000	<10000	<10000
(87)	400	<10000	<10000	<10000
Minimum Repo	rtable Value (MRV)	10000	10000	10000

NOTES: "<" = actual result is less than reported value, based on a count of zero for the filter and the particular dilution used (10- or 100-fold).

dilution used (10- or 100-fold).

"~" = approximate value, based on counts between 1 and 9 and the particular dilution used (10- or 100-fold).

Concentrations of organic matter, nutrients and inorganic contaminants in Lake George Channel and Little Lake George surficial sediments. All concentrations on dry weight basis. Table 7.

anic Matter Nutrients	Nutrients	Nutrients	Autrients								Inorganie	Inorganies and Heavy Metals	fetals					
N TOC TP	TOC	<u>a-</u>			TKN	Arsenic (Cadmium Chromlum	bromium	Copper	Cyanide (avail)	Cyanide (free)	Iron	Lead	Manganese Magnesium	Magnesium	Mereury	Nickel	Zluc
shore g kg g . kg g g . kg g g . kg g	g.kg' g.kg'	g.kg '		g.k	÷.00	mg.kg '	mg.kg ⁻¹	mg kg ¹	mg.kg '	mg.kg ⁻¹	mg.kg¹	mg.kg ⁻¹	mg.kg⁴	mg.kg ^{-t}	mg kg '	mg.kg 1	mg.kg 1	mg kg ¹
150 21 20 0.22 0.53	20 0.22	0.22		0.53		8.4	0.99	ଞା	21	0.63	0.010 <w< td=""><td>45000</td><td>62</td><td>8</td><td>4700</td><td><0.01<w< td=""><td>26</td><td>외</td></w<></td></w<>	45000	62	8	4700	<0.01 <w< td=""><td>26</td><td>외</td></w<>	26	외
500 110 77 0.59 4.60	65.0	0.59		4.60		91	0.23 <t< td=""><td>61</td><td>32</td><td>1.7</td><td>0.010<w< td=""><td>12000</td><td>21</td><td>120</td><td>1400</td><td>0.11</td><td>7.4</td><td>71</td></w<></td></t<>	61	32	1.7	0.010 <w< td=""><td>12000</td><td>21</td><td>120</td><td>1400</td><td>0.11</td><td>7.4</td><td>71</td></w<>	12000	21	120	1400	0.11	7.4	71
150 28 19 0.50 1.00	0.50	0.50		9	-	2.6	0.51	37	37	0.41	0.010 <w< td=""><td>24000</td><td>57</td><td>230</td><td>1900</td><td>0.33</td><td>7</td><td>99</td></w<>	24000	57	230	1900	0.33	7	99
150 57 41 062 2.10	41 0.62	0 62		2.10	-	8.42	0.52	æ1	77	0.739	0.010 <w< td=""><td>23513</td><td>위</td><td>319</td><td>3887</td><td>0.25</td><td>13</td><td>위</td></w<>	23513	위	319	3887	0.25	13	위
300 100 78 0.96 2.75	78 0.96	96.0		2.75		=1	0.82	ଞା	કા	1.018	0.010 <w< td=""><td>46497</td><td>27</td><td>225</td><td>2600</td><td>0.30</td><td>121</td><td>502</td></w<>	46497	27	225	2600	0.30	121	502
100 72 49 1.00 4.00	91 61	0		9-19		8.10	0.95	54	21	0.85	0.010 <w< td=""><td>32000</td><td>8</td><td>320</td><td>3000</td><td>0.32</td><td>21</td><td>200</td></w<>	32000	8	320	3000	0.32	21	200
91	40 0.37	0.37		0.80		6.50	0.34	56	21	0.13	0.010 <w< td=""><td>23000</td><td>21</td><td>250</td><td>1700</td><td>60.0</td><td>9.3</td><td>91</td></w<>	23000	21	250	1700	60.0	9.3	91
	64 0.79	0.79		2.45		=	2]	81	ક્રા	1.99	0.010 <w< td=""><td>58498</td><td>281</td><td>909</td><td>3550</td><td>0.29</td><td>ଯା</td><td>285</td></w<>	58498	281	909	3550	0.29	ଯା	285
	83	990		09:1		8.80	0.74	191	4	8.0	0.010 <w< td=""><td>45000</td><td>136</td><td>490</td><td>2500</td><td>0.12</td><td>17</td><td>2 </td></w<>	45000	136	490	2500	0.12	17	2
37 23 0.31 0.99	23 0.31	0.31		660		2.30	0.36	24	41	0.082	0.010 <w< td=""><td>0068</td><td>20</td><td>110</td><td>1800</td><td>60.0</td><td>7.2</td><td>89</td></w<>	0068	20	110	1800	60.0	7.2	89
19 14 0.40 0.84	0 40	0 40		0.84		09.1	0.24 <t< td=""><td>24</td><td>의</td><td>0.022<t< td=""><td>0.010<w< td=""><td>12000</td><td>15</td><td>200</td><td>3100</td><td>0.02<t< td=""><td>10</td><td>54</td></t<></td></w<></td></t<></td></t<>	24	의	0.022 <t< td=""><td>0.010<w< td=""><td>12000</td><td>15</td><td>200</td><td>3100</td><td>0.02<t< td=""><td>10</td><td>54</td></t<></td></w<></td></t<>	0.010 <w< td=""><td>12000</td><td>15</td><td>200</td><td>3100</td><td>0.02<t< td=""><td>10</td><td>54</td></t<></td></w<>	12000	15	200	3100	0.02 <t< td=""><td>10</td><td>54</td></t<>	10	54
75 0.82	75 0.82	0.82		2.10		=1	1.20	% 	87	3.2	0.019 <t< td=""><td>61000</td><td>ঙ্গা</td><td>2</td><td>4200</td><td>0.34</td><td>27</td><td><u>§</u></td></t<>	61000	ঙ্গা	2	4200	0.34	27	<u>§</u>
100 62 <u>56</u> 0.51 <u>0.90</u>	15.0	0.51		0.90		7.09	0.72	<u>36</u>	ଧା	1.15	0.019 <t< td=""><td>41648</td><td>SI SI</td><td>391</td><td>2699</td><td>0.24</td><td>의</td><td>12</td></t<>	41648	SI SI	391	2699	0.24	의	12
24 14 0.25 0.53	14 0.25	0.25		0.53		2.40	0.31	22	의	0.062	0.010 <w< td=""><td>13000</td><td>18</td><td>150</td><td>1600</td><td>90.0</td><td>7.6</td><td>99</td></w<>	13000	18	150	1600	90.0	7.6	99
320 76 5.8 <0.01 <w 4.9<="" td=""><td>5.8 <0.01<w< td=""><td><0.01<w< td=""><td></td><td>4.9</td><td></td><td>ଛା</td><td>1.80</td><td><u>72</u></td><td><u>8</u></td><td>2.800</td><td>0.019<t< td=""><td>58000</td><td>3</td><td>830</td><td>4700</td><td>0.24</td><td>37</td><td>450</td></t<></td></w<></td></w<></td></w>	5.8 <0.01 <w< td=""><td><0.01<w< td=""><td></td><td>4.9</td><td></td><td>ଛା</td><td>1.80</td><td><u>72</u></td><td><u>8</u></td><td>2.800</td><td>0.019<t< td=""><td>58000</td><td>3</td><td>830</td><td>4700</td><td>0.24</td><td>37</td><td>450</td></t<></td></w<></td></w<>	<0.01 <w< td=""><td></td><td>4.9</td><td></td><td>ଛା</td><td>1.80</td><td><u>72</u></td><td><u>8</u></td><td>2.800</td><td>0.019<t< td=""><td>58000</td><td>3</td><td>830</td><td>4700</td><td>0.24</td><td>37</td><td>450</td></t<></td></w<>		4.9		ଛା	1.80	<u>72</u>	<u>8</u>	2.800	0.019 <t< td=""><td>58000</td><td>3</td><td>830</td><td>4700</td><td>0.24</td><td>37</td><td>450</td></t<>	58000	3	830	4700	0.24	37	450
400 58 34 0.49 1.80	34 0.49	0.49		1.80		6.20	0.62	38	281	0.47	0.010 <w< td=""><td>21000</td><td>श्र</td><td>280</td><td>3800</td><td><0.01<w< td=""><td><u>≈</u>1</td><td>140</td></w<></td></w<>	21000	श्र	280	3800	<0.01 <w< td=""><td><u>≈</u>1</td><td>140</td></w<>	<u>≈</u> 1	140
\$ 02 0.02 0.10	0.02 0.02	0.02		0.10	1.	0.20	0.05	2	-	0.010	0.010	20	-	:	:	0.01	-	-
	66 0.27	0.27		0.30		3.2	0.87	14	긺	0.022 <t< td=""><td>0.010<w< td=""><td>7400</td><td>21</td><td>94</td><td>1800</td><td>0.03<t< td=""><td>7.1</td><td>07</td></t<></td></w<></td></t<>	0.010 <w< td=""><td>7400</td><td>21</td><td>94</td><td>1800</td><td>0.03<t< td=""><td>7.1</td><td>07</td></t<></td></w<>	7400	21	94	1800	0.03 <t< td=""><td>7.1</td><td>07</td></t<>	7.1	07
09	:			;	_	;	:	;	1	0.1	0.1	:	;	ı	ŧ	:	;	;
10 0.6 0.55	10 0.6	9.0		0.55		9	9.0	26	91	:	:	20000	31	460	;	0.2	16	120
100 2 4.8	100 2	2		4.8		33	10	110	110	:	:	40000	250	1100	:	2	75	820

"--" = not available. NOTES:

"<T" = a measurable trace amount; interpret with caution.

[&]quot;<W" = no measurable response (zero); less than reported value.

[&]quot;+" = upstream background concentration in Point aux Pins Bay (Kauss, 1999; OMOE 1986-87).

PSQG-LF1." = Lowest Effect Level of contamination that can be tolerated by the majority of benthic organisms (Persaud et al., 1993). "OWDMDG" = concentration below which disposal of dredged material in open water is permitted (Persand & Wilkins, 1976).

PSQG-SEL" = Severe Effect Level" of contamination at which pronounced disturbance of the benthic community can be expected: TOC-normalized (Persaud et al., 1993) Underlined values in shaded cells exceed the PSQG-LEL or OWDMDG; bolded values exceed the PSQG-SEL.

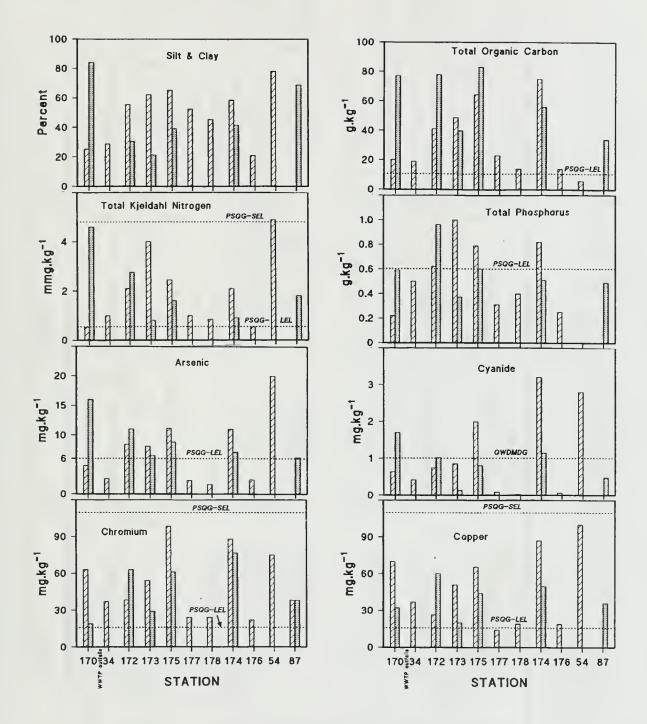


Figure 13. Silt and clay content and concentrations of total organic carbon, total Kjeldahl nitrogen, total phosphorus, arsenic, cyanide, chromium and copper in Lake George Channel and Little Lake George surficial sediments. Bars with diagonal lines represent stations closest to shore; shaded bars represent offshore stations.

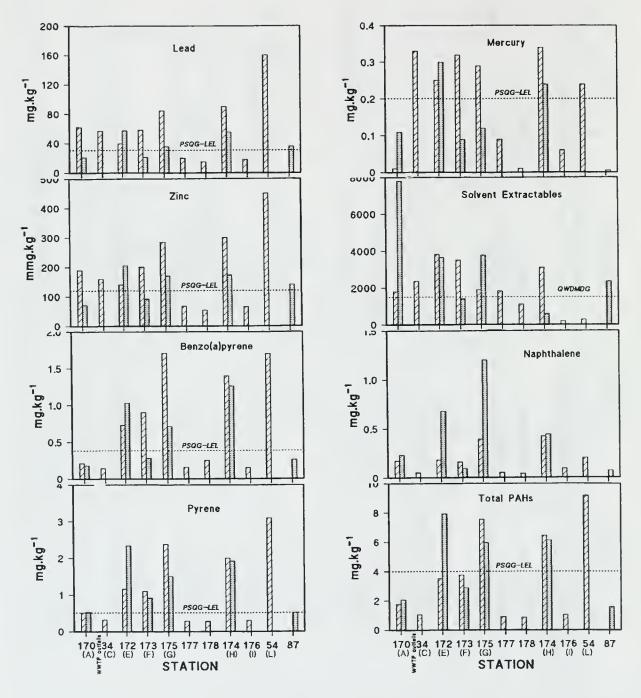


Figure 14. Concentrations of lead, mercury, zinc, solvent extractables, benzo(a)pyrene, naphthalene, pyrene and Total PAHs in Lake George Channel and Little Lake George surficial sediments. Bars with diagonal lines represent stations closest to shore; shaded bars represent offshore stations.

Concentrations of solvent extractables and polycyclic aromatic hydrocarbons in Lake George Channel and Little Lake George surficial sediments. All concentrations in mg.kg⁻¹, dry weight basis. Table 8.

NOTES:

".." = not available."<T" = a measurable trace amount; interpret with caution. "<W" = no measurable response (zero); less than reported value.

[&]quot;OWDMIDG" = concentration below which disposal of dredged material in open water is permuted (Persaud & Witkins, 1976). "*" = upstream background concentration in Point aux Pins Bay (Kauss, 1999).

[&]quot;PSQG-LEL." - Lowest Effect Level of contamination that can be tolerated by the majority of benthic organisms (Persand et al., 1993.

[&]quot;PSQG-SEL" = Severe Effect Level" of contamination at which pronounced disturbance of the benthic community can be expected; Requires TOC-normalization (Persand et al., 1993.

Underlined values in shaded cells exceed the PSQG-LEL or OWDMDG; bolded values exceed the PSQG-SEL.

Disposal of Dredged Material (Persaud & Wilkins, 1976). Levels of iron from seven of the stations also exceeded the Provincial "Severe Effect Level" (SEL) sediment quality guideline of 40,000 mg.kg⁻¹ (Table 7). The LEL and SEL guidelines are, respectively, concentrations below which the majority (95%) of benthic organisms would be protected and above which pronounced disturbance of the benthic community can be expected (Persaud, *et al.*, 1993).

Total phosphorus only exceeded the PSQG-LEL of 0.60 g.kg⁻¹ at stations on Transects E, F, G and H, all downstream of the WWTP, but total Kjeldahl nitrogen exceed the PSQG-LEL of 0.55 g.kg⁻¹ on all but one transect, and exceeded the PSQG-SEL of 4.80 g.kg⁻¹ on transect L (Table 7 and Fig. 13).

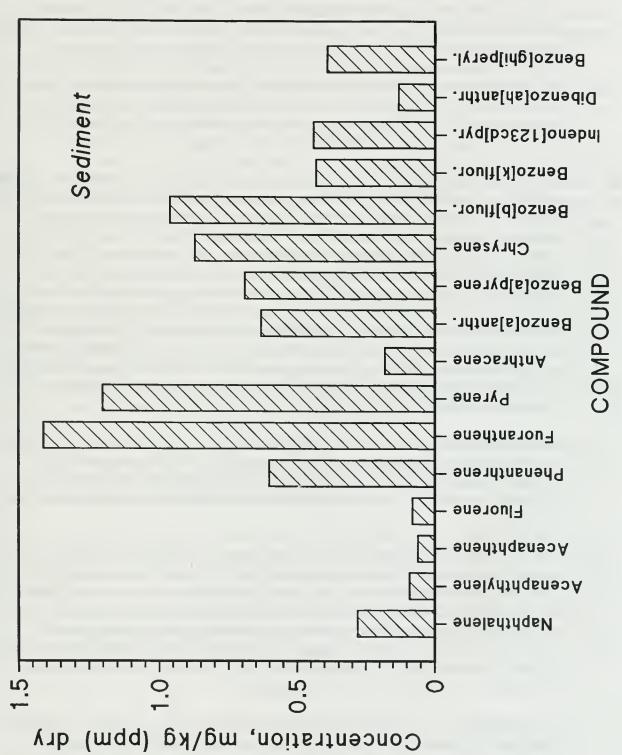
Concentrations of solvent extractables exceeded the Provincial Open Water Dredged Material Disposal Guideline of 1,500 mg.kg⁻¹ at stations on Transects C, E, F, G and H, and at 177 and 87, as well as at the upstream reference stations on Transect B, which had the highest concentration (Table 8). This is contrary to the other contaminants, and suggests a dominating influence from upstream sources (Fig. 14).

All 16 of the unsubstituted PAH compounds analyzed for were detected at all stations; however, concentrations were usually less than 1 mg.kg⁻¹. Compounds with the highest concentrations included fluoranthene, phenanthrene and pyrene (Table 8). Presently there are Provincial Sediment Quality Guidelines for 12 individual PAH compounds and for "Total PAHs'. However, sediments from six of the stations, all downstream of the WWTP discharge, contained total PAH levels that exceeded the Provincial LEL of 4 mg.kg⁻¹ (Fig. 14). Concentrations of many of the individual PAH compounds (as well as of total PAHs) were highest at stations on Transects E, F, G, H and L, located downstream of the WWTP discharge, and 11 of these PAHs exceeded their respective PSQG-LELs (Table 8; Fig. 14).

Of the 16 unsubstituted PAHs analyzed for in the present study, fluoranthene, pyrene, benzo(b)fluoranthene and chrysene were, on average, present at the highest concentrations. This pattern (Fig. 14) is quite similar to that reported for sediments collected upstream, in the Algoma Slag Dump nearshore in 1989 (Kauss, 1999).



Figure 15.



Average PAH compound profile in sediments. Compounds are listed order of decreasing water solubility, from

6.0 CONCLUSIONS AND RECOMMENDATIONS

(i) During the June and August 1989 surveys, the East End WWTP design capacity was exceeded once, during a period of high rainfall on August 22nd. WWTP discharge loadings were greatest for all measured parameters (suspended solids, chloride, bacteria (fecal coliforms, *Escherichia coli*, *Pseudomonas aeruginosa*), ammonium, total Kjeldahl Nitrogen, total phosphorus, phenolics, iron and zinc) on August 22nd, due to the high discharge rate and elevated levels in the final effluent. On this day, estimated loadings of faecal coliforms were up to 200 times greater, while suspended solids, ammonia, total Kjeldahl nitrogen, total phosphorus, iron and zinc loadings were up to two times greater than on the day with the lowest loading.

The impact of the WWTP discharge on Lake George Channel water quality was evident on fecal coliforms, *E. coli*, *Pseudomonas aeruginosa*, conductivity, chloride, ammonia, total Kjeldahl nitrogen, total phosphorus, phenolics, iron and zinc, levels of which increased noticeably downstream of the discharge point during both surveys. The greatest effect on bacteria densities in river water was found on August 22nd and 23rd, during and immediately following the period of heavy rainfall. For example, fecal coliform densities exceeded the PWQO for the protection of recreational users as far as 4.7 km downstream (i.e., at Bell Point). (*E. coli* accounted for 42% to 85% of the fecal coliforms in the final effluent.) Total phosphorus exceeded the PWQO to prevent excessive aquatic plant growth in rivers for a distance of up to 0.9 km downstream of the discharge point. Phenolics concentrations exceed the PWQO to prevent tainting of fish flesh at upstream as well as downstream locations, indicating the influence of sources located upriver of the WWTP.

<u>Recommendation</u>: Increases in the efficiency of bacterial treatment and contaminants removal should be pursued. Also, the influence of high rainfall events on WWTP discharge quality and loadings should be minimized, either through plant capacity expansion, or temporary containment of storm water runoff until proper treatment can be effected.

(ii) The discharge area for the WWTP is on a shallow shelf of less than 2 m depth, where currents are quite variable - but typically less than 10 cm.sec⁻¹, with variable direction of flow. Because of the shallowness, flow in the discharge area is more susceptible to influence by the wind than the deeper, faster moving waters of the main channel. For example, under northeast wind conditions, the direction of travel of drogues was initially perpendicular to shore, progressing to about 45 degrees relative to the shore for the first 200 m of travel. This can cause the WWTP discharge plume to impinge on U.S. waters (i.e., result in transboundary pollution).

<u>Recommendation</u>: In conjunction with Recommendation (i), if possible, the discharge point should be moved into deeper, faster moving water to improve the dispersion characteristics and mitigate adverse impacts on nearby waters and surficial sediments.

In combination, Recommendations (i) and (ii) would also avoid undesirable impacts within the river further downstream, including transboundary pollution.

(iii) Surficial sediments in Lake George Channel and in Little Lake George were generally very organic in nature (i.e., "oozy"), often with a sewage or oily odour. All samples had an oily sheen. Sediments from up to 2 km downstream of the WWTP discharge contained elevated densities of fecal coliform, Escherichia coli and fecal Streptococcus bacteria. Densities of these organisms reached as high as about 134,000, 14,400 and 21,000 organisms per kg of wet sediment. Concentrations of nutrients and persistent inorganic contaminants (e.g., heavy metals) usually increased downstream of the WWTP discharge, and concentrations were often higher at inshore stations than at offshore stations. Correlation analysis indicated that concentrations of arsenic, cyanide, heavy metals and many of the individual PAH compounds correlated significantly with one another, suggesting a common source. Concentrations of many of the contaminants in Lake George Channel and Little Lake George sediments, as well as at the upstream reference, exceeded the Lowest Effect Level Provincial Sediment Quality Guidelines for the protection of benthic organisms. This indicates that upstream sources contribute or have contributed to sediment quality problems in the Lake George Channel and in Little Lake George. These contaminants include arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, total PAHs and of 11 individual PAHs. In addition, concentrations of available cyanide at some stations exceeded the Provincial guideline for Open Water Dredged Material Disposal. Iron also exceeded the Provincial "Severe Effect Level" (SEL) sediment quality guideline at some stations. Total phosphorus only exceeded the PSOG-LEL at some stations downstream of the WWTP. but total Kjeldahl nitrogen exceed the PSQG-LEL on all but one transect.

Concentrations of solvent extractables exceeded the Provincial Open Water Dredged Material Disposal Guideline at stations on downstream transects, as well as at the upstream reference stations, which had the highest concentration. This suggests a dominating influence from upstream sources.

Recommendation: The WWTP discharge was identified as contributing, on average, 31.7 and 1.2 kg.day⁻¹ of iron and zinc, respectively. Further monitoring should be conducted on the WWTP final effluent to determine the concentrations and loadings of the persistent contaminants exceeding guidelines in Lake George Channel sediments. Also, the relative contribution of upstream sources and their loadings to sediment contamination in Lake George Channel and Little Lake George should be investigated. This includes point and non-point sources.

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APPENDIX

Table A-1. 1989 effluent, water and sediment quality sampling station locations.

				Station Descript	ion	
	Distance (m.)	from.				
Transect (Number)	WWTP outfalls, upstream (\(\mu \s \) or downstream (\(\mu \s \) s)	Canadian shore	Water Depth, m	Latitude	Longitude	Remarks
ì	0	-150	0 1	46°30'16"	84°15'22"	Sault Ste. Marie, ON East End WWTP final contact chambe
B (170)	100 u/s	150 500	1 2.3	46°30′13"	84°15′26″	control u/s of Cass Pount; on SMD 4.87E (ON) control u/s of Cass Pount; on SMD 4.87E (M1)
C (34)	100 d/s 	150 200	l 1	46°30′20"	84°15'23"	immediately d/s of WWTP discharge; on SMD 5 0E
D (171)	360 d/s	140	1			on SMD 5.17E
"	300 @3	150	1.2			on 5/1/5
**	44	160	1.5			66
44	**	180	1.5			44
**	**	225	2			**
**	44	300	4	46°30'27"	84°15'15"	
E (172)	500 d/s	150	1			on SMD 5 26E
**	**	160	1			**
**	66.	180	1 5			4b
44	0.6	200	1.5			46.
**	60	220	1.5			**
**	**	240	1.5			
.,	60	250	1.5			
**	44	300 350	3 5			61
**	69	400	10	46°30'31"	84°15'12"	on SMD 5 26E;; at Brassar Point
F (173)	900 d/s	100	1			on SMD 5.5E
**	**	150	1.1			*1
**	64	175	1.5			**
**	44	200	2 1			64
**	0.6	225	2.5			66
**	44	250	3.2			44
**	0.0	300	5.7			•
44	**	350 500 *	10 10 6	46°30'44"	84°15′03"	on SMD 5 5E; in Masta Bay
		300 -	10 0	40 30 44	64 1303	Oli SIMD 3 SE, ul Masia Bay
G (175)	1200 d/s	50	4.5	46°30'50"	84°14'56"	off storm sewer; opposite Point Lewis
44	**	150	- 6.5			
177	1300 d/s	20	- 1 5	46°30′54"	84°14′52"	off 51 River Road
178	1330 d/s	٠ ٥	~ 1.5	46°30'55"	84°14'21"	in private boat slip
H (174)	1700 d/s	50	~ 1 5			on SMD 6.0E; near Air-dale Ltd
04	44	100	4			on SMD 6.0E
44	40	200	14			44
44	**	300	10 3			41
**	**	400 *	4.3	46°31'05"	84°34'41"	on SMD 6.0E; d/s of Point Lewis
1 (176)	2300 d/s	10	- 1.5	46°30'54"	84°14′53″	off beach at Partridge Point
L (54)	4700 d/s	320 -	6			on SMD 7.9E; off beach at Bell point
**	"	400 *	9.3			on SMD 7.9E
**	**	650 "	10.1	46°32'27"	84°13'12"	on SMD 7.9E; at Palmers Point
87	6750 d/s	400	1.8	46°32'57"	84°11'31"	in Little Lake George

NOTES.

[&]quot;"=" = water sampled at only 0.2 of total depth.
""<" = less than.
""-" = approximately
"SMD" = IJC river range; positions are "fixed" at U.S. shore.

Summary of project analytical requests and capabilities, historical survey data and water quality objectives Table A-2.

			A	Analytical Method *				Observed Values **	/aiues **	Water	Water Quality Objectives
Parameter	Reporting Units Method Code	Method Code		Standard Deviation of:	Lab. Blank	Lowest	T Value	Background	WWTP Effluent	GLWQA Objective	OMOE PWQ Objective/Guideline
			Lab.	Lab. Duplicates		Reportable					
			Controls			· care					
Turbidity	FTU	002AII	0.11	0.056 to 0.241	0.057	0.05	0.25		1	-	<10% increase
Suspended Solids	mg.i ⁻¹	206AB5	0.000021	1.07 to 1.87	0.213	0.5	2.5	1.6 <t 3.5<="" td="" to=""><td>29.4 to 53.2</td><td>*</td><td>-</td></t>	29.4 to 53.2	*	-
pH		003A12	0.041	0.152 to 0.196	-	0	0		7.99 to 8.15	6.5 to 9 0	65 to 8.5
Conductivity @ 25°C	μπhos.cm ¹	002B12	2.59	0 79 to 1 86	**	1	5	97.6 to 102.4	536 to 688	TDS not >present level	<1/3 TDS increase over present level
Chloride as Cl	mg.f ⁻¹	004BC2	0.15	0.121 to 0.161	-0.031	0.2	1	1.20 to 1.85	60 to 75	1	;
Total Phosphorus, as P	mg.l ⁻¹	504BC2	0.024	0.0129 to 0.0491	0.001	0.020	0.100	0.004 <t 0.020<t<="" td="" to=""><td>2,80 to 5.53</td><td></td><td>0.030</td></t>	2,80 to 5.53		0.030
Ammonia, as N	mg.1	103DC2	0.008	0.003 to 0.018	0.0019	0.002	0.010	0.046 to 0.066	11.6 to 21.0	0.02 (unionized); 0.5 total	0.02 (unionized)
Total Kjeldahl Nitrogen, as N	mg.1	004AC2	0.013	0.0173 to 0.0326	0.018	0.020	0.100	0.046 to 0.200	15.5 to 30.6		
Phenolics, 4AAP reactive as Phenol	μg.11	002BC2	0.48	0.148 to 0.848	1	0.2	0.1	0.6 <t 1.8<="" td="" to=""><td>1.8 to 23.6</td><td>-</td><td>_</td></t>	1.8 to 23.6	-	_
Total Iron, as Fe	mg.11	536BA1	0.134	0.037 to 0.056	0.021	0.003	0.010	<0.050 to 0.110	0.81 to 2.20	0.300	0.300
Total Zinc, as Zn	mg.11	535BA1	0.034	0.002	0.004	0.001	0.001	<0.001 to 0.003	0.04 to 0.41	0.030	0.030
Faecal Coliforms	organisms.df1	TF124	:	2.9 to 9.0		10	-	10 to 108	900 to 5.1x10°		100
Escherichia coli	organisms.dl '	TFC24	-	2.6 to 19.1		10	-	8 to 68	800 to 4.5×10 ⁶		
Pseudomonas aerugmosa	organisms.dl ⁻¹	PF48	:	1.9 to 7.6	:	10	1	9 to 13	20 to 4.7x10 ³	:	1

NOTES

"*" from OMOE (1983 & 1991)
"**" from 1986/87 St. Marys River MISA Pilot Site Study (OMOE, unpubl. data); background = station 440 m upstream of WWTP discharge.
"..." = not available.

Comparison of project analytical requests and capabilities, and historical survey data with sediment quality objectives. Table A-3.

				Analytic	Analytical Method*			Observed Values**	nes**	Sediment Quality Objectives
Parameter	Reporting Unita	Method	Standard D Controls	Standard Deviation of: ontrols Duplicates	Blank	Lowest Detectable, W	T Value	Background	Lake George Channel	MOE Dredging Guideline
	1.001	25000	474	V N	¥ N	1000	AM	V 2	230 000-800 000	¥ Z
Fecal Colitorm	org.100g	FCMMF	4 2	¢ ₹	Ç Z	000	Z Z	Ž	43.000-240,000	NA.
E. COII	org 100g-1	FSMF	Z Z	\ Z	×	1000	Y.	Ž	NA NA	NA
Percal Streptive Courses	4	007PZ1	¥ Z	VA	Ϋ́	0.1	NA NA	49	23	NA
Percent Moisture	. 8e	009AB1	A'A	NA	NA	ΝA	NA	55	29-70	NA
Residual Loss on Ignition	mg.g.1	001AI2	3.05	0.85 to 9.47	NA	5.0	NA	89	23-140	09
Total Organic Carbon	mg. g.	001AI0	NA NA	NA	NA	5.0	NA	28	20-02	NA
Total Phosphorus	mg.g.1	314CC2	0.03	0.02 to 0.07	4.85	0.02	NA	0.27	0.22-1.2	1.0
Total Kieldahl Nitrogen	mg.g.¹	314CC2	90.0	0.05 to 0.38	NA	0.10	0.10 to 0.20	30	0.80-4.5	2.0
Total Arsenic	ug.g. 1	542AF3	1.58	0.14 to 0.38	NA	0.20	NA AN	NA	ΥN	8.0
Free Cvanide	42.9.1	Z	Y'N	VA	٧N	0.01	NA NA	NA NA	VA V	NA
Available Cvanide	1.2.2.1	Z V	Y'X	NA	NA	0.01	NA NA	NA	٧N	NA
Total Cadmium	WR.R.	535AA0	0.81	0.07 to 0.17	0.05	0.20	NA VA	0.5	0.35-2.4	1.0
Total Chromium	WR.R.1	535AA0	25.5	1.45 to 2.57	1.60	2.00	NA A	9.6	21-110	20
Total Conner	ue.e.1	535AA0	150	1.05 to 3.23	1.26	1.00	ΝΑ	VA VA	٧×	25
Total Iron	ug.g.1	535AA0	1,262	437 to 1,857	1.80	20.00	ΝA	5,400	15,000-81,000	10,000
Total Lead	HR.R.	535AA0	94.5	1.25 to 14.40	1.33	1.00	NA	24	18-130	20
Total Magnesium	# 50 m	535AA0	NA	VA	NA	Y'N	ΥV	970	1,300-5,400	NA
Total Manganese	ug.g.1	535AA0	38.1	12.88 to 79.90	0.14	2.50	ΥV	55	130-780	NA
Total Mercury	42.2-1	541AF1	0.03	0.01 to 0.07	٧Z	0.01	٧٧	NA	٧V	0.3
Total Nickel	H. S. 1	535AA0	62.6	0.51 to 4.55	86.0	1.00	NA	4.2	7.5-47	NA
Total Zinc	MS·S ⁻¹	535AA0	294	5.19 to 17.75	7.32	1.00	٧V	24	50-380	100
Solvent Extractables	48.8.1	0W009X	NA	NA A	NA	-	NA	1,260	989-2,152	1,500
Polycyclic Aromatic Hydrocarbons										;
(16 compounds)	µ8.8.1	EN100A	٧Z	٧X	NA	0.01 to 0.07	0.01 to 0.07	0.01 < T-0.07 < T	3.17 <t-10.4< td=""><td>∀ Z</td></t-10.4<>	∀ Z

From MOE (1983) and Surgis (1987)
 ** St. Marys River MISA Pilot Site State Study (1992), background = Point aux Pins Bay; bacteria data from floating material collected in July 1989.
 NA = Not Available

Table A-4. Meteorological conditions prior to and during July and August, 1989 surveys.

			at	Sault Ste. N	Aarie, ON a	irport	on surv	ey vessel
Da	te	Rainfall,	Wind Spe	ed, km.h ⁻¹	Wind	Direction	W	'ind
Month	Day	mm.	Average	Range	Average	Range	km.h ⁻¹	Direction
June	20	0.0	.5.7	0 - 15	SSE	E - WSW		
	21	0.0	9.7	0 - 22	ESE	E - SE		
	22	0.0	10.6	0 - 22	SE	E - SSW		
"	23	13.4	12.0	7 - 22	Е	E - SSE		
	24	trace	17.8	0 - 30	NW	E - NNW		
	25	0.4	9.4	0 - 22	NW	E - NW		
"	26	0.2	6.3	0 - 20	SW	E - W		
"	27 *	trace	11.0	0 - 24	NW	N - NNW	9 - 18	SW
"	28 *	0.0	19.6	7 - 35	NW	N - NW	14 - 19	NE
**	29 *	0.0	5.6	0 - 17	NW	SE - NW		
	30 *	0.0	7.3	0 - 19	Е	E - SW		
July	1 *	0.0	6.2	0 - 15	Е	E - WSW		
August	15	1.6	19.3	7 - 28	NW	W - NNW		
"	16	0.0	16.9	0 - 28	NW	N - NWW	~-	
"	17	0.0	6.5	0 - 15	W	ENE - NNW		
	18	0.0	7.5	0 - 15	SSE	ENE - S		
4.6	19	00	9.5	6 - 15	ESE	E-S		
	20	0.6	12.0	4 - 28	NW	E - NNW	~-	
4.	21	trace	17.1	0 - 32	WNW	N - NNW		
	22 *	11.2	9.6	0 - 26	Е	N - NNW	0 - 32	ESE
	23 *	0.0	10.7	0 - 24	WNW	N - NNW	9 - 28	NNE
	24 *	0.0	11.0	0 - 22	ENE	N - NNW	9 - 19	NE

NOTES: Airport weather data courtesy of Environment canada, Atmosheric Environment Service.

[&]quot; * " = survey day.

[&]quot;-" = data not available.

Table A-5. River water sample field blind duplicate (split) data.

		Station:		WWTP effluent	fluent		Stadon 170	170	Station 34	n 34				Stadon 171	171			
		Oate:	Jun 28	28	Aug 24	24	Jun 28	28	Aug 24	24	Jun 27	27	Jun 29	28	Aug 22	22	Aug 24	24
		m. from shore:	0		0		100	0	200	0	180	-	180	0	180		300	0
Paremeter	Under	Sample No.:	26007	25008	83788	83800	83841	83842	88521	88522	83808	83808	83877	83878	88431	88432	88518	88520
Conductivity	/va.cm.¹		785.0	788.0	822.0	823.0	82	98	180.0	187.0	98.0	88.0	118.0	0.001	88.0	0.88	11.0	111.0
Chloride	mg.f.		88.20	88.40	88.80	81.20	0.20 < W	160	11.70	10.20	1.40	1.40	4.80	4.40	1.80	1.50	3.30	3.10
Ha	-log,ol-		7.88	7.87	7.46	7.48	7.78	7.87	7.35	7.38	7.83	7.85	7.86	7.83	7.85	7.88	7.78	7.83
Turbidity	FTO		11.20	11.80	8.60	8.10	1.80	0.43	2.50	2.20	2.10	1.80	1.22	8.80	2.40	3.30	1.38	1.18
Suspended Solids	mg.l.		21.8	20.7	18.4	21.3	3.2	7.0	4.2	4.2	1.5 <t< th=""><th>2.3<t< th=""><th>2.8</th><th>2.8</th><th>4.0</th><th>3.8</th><th>2.8</th><th>2.9</th></t<></th></t<>	2.3 <t< th=""><th>2.8</th><th>2.8</th><th>4.0</th><th>3.8</th><th>2.8</th><th>2.9</th></t<>	2.8	2.8	4.0	3.8	2.8	2.9
Ammonia	mg.l		22.000	21.800	18.400	18.400	0.022	0.020	2.880	2.480	0.038	0.038	0.676	0.584	0.058	0.082	0.544	0.542
Total Kjeldahl Nitrogen	"I.gm		26.100	26.300	22,600	22.800	0.180	0.200	3.800	3.050	0.200	0.200	0.676	0.850	0.240	0.220	0.740	0.740
Total Phosphorus	mg.l.		0.800	0.820	0.820	0.580	0.008 <t< th=""><th>0.010</th><th>0.118</th><th>0.100</th><th>0.008<t< th=""><th>0.010</th><th>0.053</th><th>0.027</th><th>0.016</th><th>0.012</th><th>0.026</th><th>0.025</th></t<></th></t<>	0.010	0.118	0.100	0.008 <t< th=""><th>0.010</th><th>0.053</th><th>0.027</th><th>0.016</th><th>0.012</th><th>0.026</th><th>0.025</th></t<>	0.010	0.053	0.027	0.016	0.012	0.026	0.025
Phenolics	1.04		66.0	80.0	38.0	38.8	0.8 < W	1.0	8.4	11.2	0.8 <t< td=""><td>1.0</td><td>2.0</td><td>1.4</td><td>3.8</td><td>5.8</td><td>8.8</td><td>11.2</td></t<>	1.0	2.0	1.4	3.8	5.8	8.8	11.2
Iron	mg.l		0.730	0.880	0.740	00.700	0.180	0.180	0.072 <t< th=""><th>0.074 < T</th><th>0.100<t 0.0012<<="" th=""><th>2.0012</th><th>0.088<t< th=""><th>0.0028</th><th>0.180</th><th>0.0018</th><th>0.081<t 0.0007<t<="" th=""><th>.0007 < T</th></t></th></t<></th></t></th></t<>	0.074 < T	0.100 <t 0.0012<<="" th=""><th>2.0012</th><th>0.088<t< th=""><th>0.0028</th><th>0.180</th><th>0.0018</th><th>0.081<t 0.0007<t<="" th=""><th>.0007 < T</th></t></th></t<></th></t>	2.0012	0.088 <t< th=""><th>0.0028</th><th>0.180</th><th>0.0018</th><th>0.081<t 0.0007<t<="" th=""><th>.0007 < T</th></t></th></t<>	0.0028	0.180	0.0018	0.081 <t 0.0007<t<="" th=""><th>.0007 < T</th></t>	.0007 < T
												-				-		
Zinc	ma.l.		0.0310	0.0280	0.0240	0.0210	0.0018 <t< th=""><th>0.0017<t< th=""><th>0.0008<t 0.0010<<="" 0.0011<t="" 0.100<t="" th=""><th>0.0011<t< th=""><th>0.100<t< th=""><th>>0100.0</th><th>0.110</th><th>0.0023<t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<></th></t<></th></t<></th></t></th></t<></th></t<>	0.0017 <t< th=""><th>0.0008<t 0.0010<<="" 0.0011<t="" 0.100<t="" th=""><th>0.0011<t< th=""><th>0.100<t< th=""><th>>0100.0</th><th>0.110</th><th>0.0023<t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<></th></t<></th></t<></th></t></th></t<>	0.0008 <t 0.0010<<="" 0.0011<t="" 0.100<t="" th=""><th>0.0011<t< th=""><th>0.100<t< th=""><th>>0100.0</th><th>0.110</th><th>0.0023<t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<></th></t<></th></t<></th></t>	0.0011 <t< th=""><th>0.100<t< th=""><th>>0100.0</th><th>0.110</th><th>0.0023<t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<></th></t<></th></t<>	0.100 <t< th=""><th>>0100.0</th><th>0.110</th><th>0.0023<t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<></th></t<>	>0100.0	0.110	0.0023 <t< th=""><th>0.180</th><th>0.0020 < 0.081 < T 0.0008 < T</th><th>.081<t< th=""><th>T>8000.</th></t<></th></t<>	0.180	0.0020 < 0.081 < T 0.0008 < T	.081 <t< th=""><th>T>8000.</th></t<>	T>8000.
						_						-				-		
Fecal Coliforma	org.dl		2600	8800	2000	2000	23 < W	12	110	120	4	4	104	100	1140	1180	40	48
Eschericia coli	org.dl		2700	4600	1400	1700	7 < W	12	80 < W	80 < W	4	4	44	38	720	980	18	38
Pseudomonas aeruginosa	org.dl.		117 < W	640	220	220	2 <w< th=""><th>4</th><th>4 × W</th><th>20</th><th>2<w< th=""><th>2 < W</th><th>38</th><th>8</th><th>&</th><th>18</th><th>00</th><th>80</th></w<></th></w<>	4	4 × W	20	2 <w< th=""><th>2 < W</th><th>38</th><th>8</th><th>&</th><th>18</th><th>00</th><th>80</th></w<>	2 < W	38	8	&	18	00	80
NOTES: "CV" = coef	fficient of v	"CV" = coefficient of variation calculated using CV = N^2 {maxmin.}/{max.+min.}}*100.	using CV -	- N2(max	min.}/(mex.	+ min.)]*10	o.											
		1 0 0 0 0																

"CV" = coefficient of variation calculated using CV = [V2{max.-min.}]/[max.+min.]]* 100.

* data from Sturgis (1887).

* <T" = a measurable trace amount; interpret with caution,

"<W" = no measurable response (zero); lessthan reported value.

"..." not available or could not be calculated.

Table A-5. continued.

		Station No.:		Station 172	172					Stetion 173	173			
		Date:	Jun 28	28	Aug	Aug 24	ي ر	Jun 27	Jun 29	29	Aug 22	22	Aug	Aug 23
		m. from ehore:	300	0	ř	300	=	160	176	9	200	0	20	200
Parameter	Units	Semple No.:	83860	93951	99512	88513	83828	93929	83882	83883	89415	88418	88467	98459
													i	
Conductivity	/w.cm ⁻¹		0.88	0.88	99.0	98.0	106.0	105.0	103.0	108.0	0.86	99.0	0.66	0.88
Chloride	mg.l.		1.90	1.80	1.90	1.80	2.50	3.20	3.10	3.10	1.50	1.60	1.70	1.70
Ha	-log,o[H *]		7.87	7.93	7.91	7.98	7.79	7.94	7.70	7.78	7.96	7.97	7.97	7.99
Turbidity	FT		1.95	1.54	1.26	1.42	1.80	1.50	1.24	1.28	1.12	1.05	1.84	1.31
Suspended Solids	mg.l.,		3.7	0.3 <w< td=""><td>3.4</td><td>9.3</td><td>2.8</td><td>0.6 < W</td><td>6.7</td><td>1.8<t< td=""><td>3.0</td><td>3.1</td><td>1.4<t< td=""><td>1.2<t< td=""></t<></td></t<></td></t<></td></w<>	3.4	9.3	2.8	0.6 < W	6.7	1.8 <t< td=""><td>3.0</td><td>3.1</td><td>1.4<t< td=""><td>1.2<t< td=""></t<></td></t<></td></t<>	3.0	3.1	1.4 <t< td=""><td>1.2<t< td=""></t<></td></t<>	1.2 <t< td=""></t<>
Ammonie	"I.DE		0.032	0.049	0.070	0.000	0.186	0.308	0.242	0.232	0.070	0.072	0.102	0.102
Total Kjeldahl Nitrogen	mg.f.,		0.320	0.290	0.200	0.210	0.580	0.680	0.320	0.320	0.210	0.270	0.260	0.240
Total Phosphorus	mg.l.		0.024	0.024	D.008 < T	0.009 < T	0.028	0.027	0.014	0.016	D.009 <t< td=""><td>D.009 < T</td><td>0.009 < T</td><td>0.009 < T</td></t<>	D.009 < T	0.009 < T	0.009 < T
Phenolics	1.00		1.0	0.1	19.4	2.8	1.8	1.0	1.2	2.0	2.2	1.8	1.4	1.4
Iron	"l.om		0.170	0.180	0.170	0.0019 <t< td=""><td>0.110</td><td>0.120</td><td>0.092<t< td=""><td>0.082<t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.088<t< td=""><td>0.0009 < T</td></t<></td></t<></td></t<></td></t<></td></t<>	0.110	0.120	0.092 <t< td=""><td>0.082<t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.088<t< td=""><td>0.0009 < T</td></t<></td></t<></td></t<></td></t<>	0.082 <t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.088<t< td=""><td>0.0009 < T</td></t<></td></t<></td></t<>	0.110	0.100 <t< td=""><td>0.088<t< td=""><td>0.0009 < T</td></t<></td></t<>	0.088 <t< td=""><td>0.0009 < T</td></t<>	0.0009 < T
Zinc	mg.i.,		0.0019 <t< td=""><td>0.0020<t< td=""><td>0.180</td><td>0.0019<t< td=""><td>0.0017 < T</td><td>0.0014 < T</td><td>0.0021<t< td=""><td>0.0028</td><td>0.0010 < T</td><td>0.016<t< td=""><td>0.072<t< td=""><td>T > 0.0010 < T</td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.0020 <t< td=""><td>0.180</td><td>0.0019<t< td=""><td>0.0017 < T</td><td>0.0014 < T</td><td>0.0021<t< td=""><td>0.0028</td><td>0.0010 < T</td><td>0.016<t< td=""><td>0.072<t< td=""><td>T > 0.0010 < T</td></t<></td></t<></td></t<></td></t<></td></t<>	0.180	0.0019 <t< td=""><td>0.0017 < T</td><td>0.0014 < T</td><td>0.0021<t< td=""><td>0.0028</td><td>0.0010 < T</td><td>0.016<t< td=""><td>0.072<t< td=""><td>T > 0.0010 < T</td></t<></td></t<></td></t<></td></t<>	0.0017 < T	0.0014 < T	0.0021 <t< td=""><td>0.0028</td><td>0.0010 < T</td><td>0.016<t< td=""><td>0.072<t< td=""><td>T > 0.0010 < T</td></t<></td></t<></td></t<>	0.0028	0.0010 < T	0.016 <t< td=""><td>0.072<t< td=""><td>T > 0.0010 < T</td></t<></td></t<>	0.072 <t< td=""><td>T > 0.0010 < T</td></t<>	T > 0.0010 < T
Fecal Coliforms	org.dl 1		4 < W	12	40	62	12	32	90	40	920	980	104	118
Eschericia coli	org.dl.		4 < W	4	24	28	4	12	62	40	480	720	72	62
Pseudomonas aeruginosa	org.dl,		2 < W	2 < W	2 <w< td=""><td>10 < W</td><td>4</td><td>2</td><td>2</td><td>7</td><td>38</td><td>28</td><td>01</td><td>6</td></w<>	10 < W	4	2	2	7	38	28	01	6

"CV" = coefficient of variation calculated using CV = [v/2/mex.+min.]]*100.
" date from Sturgie (1997).
" <T" = a measurable trace amount; interpret with caution.
" <W" = no measurable response (zero); lessthan reported value.
"-" not evailable or could not be calculated.

NOTES:

											1 1 3	***************************************	Veneziaty (CV). 76	
	Date:	Jun 27	27	Jun 29	28	Aug 23	23	A	Aug 22	Au	Aug 23			
	m. from shore:	100	0	300	0	100	9	e,	320	60	860			Leboratory
Parameter Units	Semple No.:	63819	83820	83667	83859	69449	88450	88402	88403	89448	88447	Field	Laboratory *	
Conductivity 18.cm.		0.89	98.0	0.98	96.0	97.0	67.0	97.0	97.0	96.0	0.88	0.0 to 12.4		
		1.40	1,40	1.40	1.40	1.40	1.40	1.60	1.40	1.30	1.30	0.0 to 9.29		
-log10H+1		7.80	7.86	7.84	7.86	7.88	9.00	7.94	7.86	8.02	8.03	0.0 to 1.44		
Turbidity		1.10	1.00	0.97	96.0	1.46	2.70	0.70	0.78	0.80	1.66	0.0 to 97.3		
Suspended Solide mg.l ⁻¹		1.3 <t< td=""><td>0.9<t< td=""><td>1.1<t< td=""><td>1.0 < T</td><td>3.8</td><td>3.8</td><td>2.4<t< td=""><td>2.2<t< td=""><td>2.2<t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.9 <t< td=""><td>1.1<t< td=""><td>1.0 < T</td><td>3.8</td><td>3.8</td><td>2.4<t< td=""><td>2.2<t< td=""><td>2.2<t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	1.1 <t< td=""><td>1.0 < T</td><td>3.8</td><td>3.8</td><td>2.4<t< td=""><td>2.2<t< td=""><td>2.2<t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<>	1.0 < T	3.8	3.8	2.4 <t< td=""><td>2.2<t< td=""><td>2.2<t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<></td></t<></td></t<>	2.2 <t< td=""><td>2.2<t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<></td></t<>	2.2 <t< td=""><td>1.8<t< td=""><td>0.0 to 120</td><td></td><td></td></t<></td></t<>	1.8 <t< td=""><td>0.0 to 120</td><td></td><td></td></t<>	0.0 to 120		
		0.040	0.042	0.018	0.008 < T	0.048	0.048	0.042	0.040	0.028	0.028	0.0 to 31.0		
Total Kjeldahl Nitrogen mg.l 1		0.180	0.180	0.140	0.140	0.240	0.180	0.160	0,180	0,160	0.160	0.0 to 27.3		
Total Phosphorus mg.l ⁻¹		0.008 <t< td=""><td>0.009<t< td=""><td>0.002 < W</td><td>0.002 < W</td><td>0.000 < T</td><td>D.009 < T</td><td>0.008<t< td=""><td>0.008 < T</td><td>0.004<t< td=""><td>0.006 < T</td><td>0.0 to 49.0</td><td></td><td></td></t<></td></t<></td></t<></td></t<>	0.009 <t< td=""><td>0.002 < W</td><td>0.002 < W</td><td>0.000 < T</td><td>D.009 < T</td><td>0.008<t< td=""><td>0.008 < T</td><td>0.004<t< td=""><td>0.006 < T</td><td>0.0 to 49.0</td><td></td><td></td></t<></td></t<></td></t<>	0.002 < W	0.002 < W	0.000 < T	D.009 < T	0.008 <t< td=""><td>0.008 < T</td><td>0.004<t< td=""><td>0.006 < T</td><td>0.0 to 49.0</td><td></td><td></td></t<></td></t<>	0.008 < T	0.004 <t< td=""><td>0.006 < T</td><td>0.0 to 49.0</td><td></td><td></td></t<>	0.006 < T	0.0 to 49.0		
Phenolics µg.l ⁻¹		0.4 < T	0.4 <t< td=""><td>0.2<t< td=""><td>0.2<t< td=""><td>2.0</td><td>9.1</td><td>1.8</td><td>1.4</td><td>1.8</td><td>0.8<t< td=""><td>0.0 to 105</td><td></td><td></td></t<></td></t<></td></t<></td></t<>	0.2 <t< td=""><td>0.2<t< td=""><td>2.0</td><td>9.1</td><td>1.8</td><td>1.4</td><td>1.8</td><td>0.8<t< td=""><td>0.0 to 105</td><td></td><td></td></t<></td></t<></td></t<>	0.2 <t< td=""><td>2.0</td><td>9.1</td><td>1.8</td><td>1.4</td><td>1.8</td><td>0.8<t< td=""><td>0.0 to 105</td><td></td><td></td></t<></td></t<>	2.0	9.1	1.8	1.4	1.8	0.8 <t< td=""><td>0.0 to 105</td><td></td><td></td></t<>	0.0 to 105		
fron mg.1-1		0.081 <t< td=""><td>0.085<t< td=""><td>0.037 < T</td><td>0.038<t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.076<t< td=""><td>0.078<t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.085 <t< td=""><td>0.037 < T</td><td>0.038<t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.076<t< td=""><td>0.078<t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<></td></t<>	0.037 < T	0.038 <t< td=""><td>0.110</td><td>0.100<t< td=""><td>0.076<t< td=""><td>0.078<t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<>	0.110	0.100 <t< td=""><td>0.076<t< td=""><td>0.078<t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<></td></t<></td></t<>	0.076 <t< td=""><td>0.078<t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<></td></t<>	0.078 <t< td=""><td>D.089<t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<>	D.089 <t< td=""><td>0.087 < T</td><td>0.0 to 138</td><td></td><td></td></t<>	0.087 < T	0.0 to 138		
Zinc mg.l ¹		0.000B < T	0.0007 < T	0.0007 < T	0.0007 < T	0.0011 <t< td=""><td>0.0011</td><td>0.0007 < T</td><td>0.0008<t< td=""><td>0.0006 < W</td><td>0.0006 < W</td><td>0.0 to 138</td><td></td><td></td></t<></td></t<>	0.0011	0.0007 < T	0.0008 <t< td=""><td>0.0006 < W</td><td>0.0006 < W</td><td>0.0 to 138</td><td></td><td></td></t<>	0.0006 < W	0.0006 < W	0.0 to 138		
Focal Coliforme org.dl ⁻¹		4	7	40	4	72	72	472	612	40	38	0.0 to 118		
Eschericis coli		4	^	28	4	99	46	300	388	24	32	0.0 to 108		
Psaudomonas seruginosa org.dl 1		2	2 < W	2	2 < W	4	89	5	14	89	12	0.0 to 94.3		

"CV" = coefficient of variation calculated using CV = [V2{max.-min.}]/(max.+min.)]*100.

* date from Sturgis (1987).

"<T" = a measurable trace amount; interpret with caution.

"<W" = no measurable response (zero); leasthan reported value.

"-" not available or could not be calculated.

Table A-6. River water samples field blank data.

Data: Data: Sample No.: 6 0.:	Jun 27 150 m 63601 2.0 0.20 < W 6.21 0.31	Jun 28 500 m 63646 2.0 0.20 < W 6.13	Jun 29 500 m 63684 2.0	Aug 22 500 m 68439	Aug 23	Aug 24 500 m	Jun 27	9
	150 m 33601 2.0 20 < W 6.21 0.31	500 m 63646 2.0 0.20 < W 6.13	500 m 63684 2.0	500 m 68439		500 m		1 - handened Dirale
	2.0 20 < W 6.21 0.31	2.0 0.20 < W 6.13	63684	68439	200 m		240 m	Laboratory Mank
0 4	2.0 20 < W 6.21 0.31	2.0 0.20 < W 6.13	2.0		68485	68526	63638	
0 "	2.0 20 < W 6.21 0.31	2.0 0.20 < W 6.13	5.0					
<u> </u>	20 < W 6.21 0.31	0.20 < W 6.13		2.0 <t< td=""><td>1.0<</td><td>2.0<t< td=""><td>2.0</td><td></td></t<></td></t<>	1.0<	2.0 <t< td=""><td>2.0</td><td></td></t<>	2.0	
u	6.21 0.31	6.13	0.20 < W	0.20 < W	0.20 < W	0.20 <w< td=""><td>3.20</td><td></td></w<>	3.20	
	0.31 37.W	-	6.23	6.17	5.69	6.07	6.07	
	3/W	- -	0.43	0.88	0.25	0.55	1.81	
-		0.8 <t< td=""><td>0.7<t< td=""><td>1.1<t< td=""><td>0.4 < W</td><td>0.5<t< td=""><td>0.5<w< td=""><td></td></w<></td></t<></td></t<></td></t<></td></t<>	0.7 <t< td=""><td>1.1<t< td=""><td>0.4 < W</td><td>0.5<t< td=""><td>0.5<w< td=""><td></td></w<></td></t<></td></t<></td></t<>	1.1 <t< td=""><td>0.4 < W</td><td>0.5<t< td=""><td>0.5<w< td=""><td></td></w<></td></t<></td></t<>	0.4 < W	0.5 <t< td=""><td>0.5<w< td=""><td></td></w<></td></t<>	0.5 <w< td=""><td></td></w<>	
0.0	0.002 < W	0.002 < W	0.002 < W	0.010	0.002 < W	0.002 < W	0.002 < W	
0.0	0.070 <t< td=""><td>0.050<t< td=""><td>0.050<t< td=""><td>0.040<t< td=""><td>0.020 < W</td><td>0.030<t< td=""><td>0.050 < T</td><td></td></t<></td></t<></td></t<></td></t<></td></t<>	0.050 <t< td=""><td>0.050<t< td=""><td>0.040<t< td=""><td>0.020 < W</td><td>0.030<t< td=""><td>0.050 < T</td><td></td></t<></td></t<></td></t<></td></t<>	0.050 <t< td=""><td>0.040<t< td=""><td>0.020 < W</td><td>0.030<t< td=""><td>0.050 < T</td><td></td></t<></td></t<></td></t<>	0.040 <t< td=""><td>0.020 < W</td><td>0.030<t< td=""><td>0.050 < T</td><td></td></t<></td></t<>	0.020 < W	0.030 <t< td=""><td>0.050 < T</td><td></td></t<>	0.050 < T	
0.0	0.003 <t< td=""><td>0.008<t 0.002<w<="" td=""><td>0.002 < W</td><td>0.003<t< td=""><td>0.002 < W</td><td>0.002 < W</td><td>0.003<t< td=""><td></td></t<></td></t<></td></t></td></t<>	0.008 <t 0.002<w<="" td=""><td>0.002 < W</td><td>0.003<t< td=""><td>0.002 < W</td><td>0.002 < W</td><td>0.003<t< td=""><td></td></t<></td></t<></td></t>	0.002 < W	0.003 <t< td=""><td>0.002 < W</td><td>0.002 < W</td><td>0.003<t< td=""><td></td></t<></td></t<>	0.002 < W	0.002 < W	0.003 <t< td=""><td></td></t<>	
<u> </u>	.2 <t< td=""><td>0.6<t< td=""><td>0.6<t< td=""><td>2.0</td><td>1.4</td><td>ម</td><td>1.0</td><td></td></t<></td></t<></td></t<>	0.6 <t< td=""><td>0.6<t< td=""><td>2.0</td><td>1.4</td><td>ម</td><td>1.0</td><td></td></t<></td></t<>	0.6 <t< td=""><td>2.0</td><td>1.4</td><td>ម</td><td>1.0</td><td></td></t<>	2.0	1.4	ម	1.0	
0.0		0.020 < W	0.020 < W	0.027 <t< td=""><td>0.020 < W</td><td>0.020 < W</td><td>0.021 < T</td><td></td></t<>	0.020 < W	0.020 < W	0.021 < T	
0		0.0005 < W	J.00100.T	0.0110	0.0039	0.0006 <t< td=""><td>0.0034</td><td></td></t<>	0.0034	
		4 < W	4 < W	16	4 < W	4 < W		
		4 < W	4 < W	16	4 < W	4 < W		
_		2 < W	2 <w< td=""><td>0</td><td>2 < W</td><td>2<w< td=""><td></td><td></td></w<></td></w<>	0	2 < W	2 <w< td=""><td></td><td></td></w<>		
18	0 9.0	0.020 W 0.0026 O		0.020 < W 0.020 < W 0.0005	0.6 <t 0.0005<w="" 0.020<w="" 0.6<t="" 2<w="" 2<w<="" 4<w="" td=""><td>0.6<t 0.6<t="" 2.0<br="">0.020<w 0.020<w="" 0.027<t<br="">0.0005<w 0.0010<t="" 0.0110<br="">4<w 16<br="" 4<w="">4<w 16<="" 2<w="" td=""><td>0.6<t 0.6<t="" 1.4<br="" 2.0="">0.020<w 0.020<w="" 0.020<w<br="" 0.027<t="">0.0005<w 0.0010<t="" 0.0039<br="" 0.0110="">4<w 16="" 4<w="" 4<w<br="">2<w 10="" 2<w="" 2<w<="" td=""><td>0.66T 0.66T 2.0 1.4 CR 0.020cw 0.020cw 0.027cT 0.020cw 0.020cw 0.0005cw 0.0010cT 0.0110 0.0039 0.0006cT 4cW 4cW 16 4cW 4cW 2cW 2cW 10 2cW 2cw</td></w></w></w></w></t></td></w></w></w></w></t></td></t>	0.6 <t 0.6<t="" 2.0<br="">0.020<w 0.020<w="" 0.027<t<br="">0.0005<w 0.0010<t="" 0.0110<br="">4<w 16<br="" 4<w="">4<w 16<="" 2<w="" td=""><td>0.6<t 0.6<t="" 1.4<br="" 2.0="">0.020<w 0.020<w="" 0.020<w<br="" 0.027<t="">0.0005<w 0.0010<t="" 0.0039<br="" 0.0110="">4<w 16="" 4<w="" 4<w<br="">2<w 10="" 2<w="" 2<w<="" td=""><td>0.66T 0.66T 2.0 1.4 CR 0.020cw 0.020cw 0.027cT 0.020cw 0.020cw 0.0005cw 0.0010cT 0.0110 0.0039 0.0006cT 4cW 4cW 16 4cW 4cW 2cW 2cW 10 2cW 2cw</td></w></w></w></w></t></td></w></w></w></w></t>	0.6 <t 0.6<t="" 1.4<br="" 2.0="">0.020<w 0.020<w="" 0.020<w<br="" 0.027<t="">0.0005<w 0.0010<t="" 0.0039<br="" 0.0110="">4<w 16="" 4<w="" 4<w<br="">2<w 10="" 2<w="" 2<w<="" td=""><td>0.66T 0.66T 2.0 1.4 CR 0.020cw 0.020cw 0.027cT 0.020cw 0.020cw 0.0005cw 0.0010cT 0.0110 0.0039 0.0006cT 4cW 4cW 16 4cW 4cW 2cW 2cW 10 2cW 2cw</td></w></w></w></w></t>	0.66T 0.66T 2.0 1.4 CR 0.020cw 0.020cw 0.027cT 0.020cw 0.020cw 0.0005cw 0.0010cT 0.0110 0.0039 0.0006cT 4cW 4cW 16 4cW 4cW 2cW 2cW 10 2cW 2cw

NOTES:

data from Sturgis (1987).
 "<T" = s measurable trace amount; interpret with caution.
 "<W" = no measurable response (zerol; less than reported value.
 "..." not avsiisble or could not be calculated.

Table A-7. Sediment sample field blind duplicates (split) data.

		Static	n 172	Statio	n 175	Variability	(CV), %	Laboratory
Parameter	Units	68233	68234	68237	68238	Field	Laboratory *	Blank *
						-		
2000-1000 μm	%	0.30	0.30	0.10	0.10	0.0		
999-62 μm	%			31.10	31.30	0.5		-
<62 μm	%	_		65.30	65.50	0.2		
Moisture	%	58.0	66.0	66.0	66.0	0.0 to 9.1		
Field Density	g.cm ⁻³	1.275	1.253	1.234	1.242	0.5 to 1.2		
Faecal Coliforms	number.kg ⁻¹	~1000	~2000	~1000	<1000	~47.1		1
Escherichia coli	number.kg ⁻¹	<1000	~1000	<1000	<1000	0.0 to ~47.1		
Faecal Streptococcus	number.kg ⁻¹	<10000	<10000	<1000	<10000	0.0 to ~116		
Loss on Ignition	g.kg-1	100.0	100.0	87.1	81.0	0.0 to 5.1	6.6	
Total Organic Carbon	g.kg ⁻¹	78.3	78.0	65.0	64.0	0.3 to 1.1	3.2	
Total Kjeldahl Nitrogen	g.kg ⁻¹	2.90	2.60	2.40	2.50	2.0 to 7.7	4.9	
Total Phosphorus	g.kg ⁻¹	1.00	0.92	0.77	0.81	3.6 to 5.9	6.0	
Arsenic	mg.kg ⁻¹	11.0	11.0	13.00	9.50	0.0 to 22.0	12.1	0.00
Cyanide, avial.	mg.kg	0.610	1.700	1.800	2.200	14.1 to 66.7	12.1	0.00
Cyanide, free	mg.kg-1	0.010 0.010 <w< td=""><td>0.010<w< td=""><td>0.010<w< td=""><td>0.010<w< td=""><td>~0.0</td><td></td><td>-</td></w<></td></w<></td></w<></td></w<>	0.010 <w< td=""><td>0.010<w< td=""><td>0.010<w< td=""><td>~0.0</td><td></td><td>-</td></w<></td></w<></td></w<>	0.010 <w< td=""><td>0.010<w< td=""><td>~0.0</td><td></td><td>-</td></w<></td></w<>	0.010 <w< td=""><td>~0.0</td><td></td><td>-</td></w<>	~0.0		-
Cadmium	mg.kg ⁻¹	0.010cW	0.0102W	1.10	1.20	6.1 to 6.9	12.8	0.04
Chromium	mg.kg	62.0	64.0	97.0	100.0	2.2	12.8	
Copper	mg.kg ⁻¹	59.0	61.0		64.0	2.4 to 3.2	9.4	1.60
Iron				67.0				
Lead	mg.kg ⁻¹	47000	46000	59000	58000	1.2 to 1.5	3.2	1.80
	mg.kg ⁻¹	57.0	58.0	86.0	83.0	1.2 to 2.5	7.8	1.33
Magnesium	mg.kg ⁻¹	2600	2600	3600	3500	0.0 to 2.0		
Manganese	mg.kg ⁻¹	530	520	600	600	0.0 to 1.3		-
Mercury	mg.kg ¹	0.32	0.28	0.28	0.30	4.9 to 9.4	10.6	
Nickel	mg.kg ¹	22.0	21.0	23.0	23.0	0.0 to 3.3	5.1	0.98
Zinc	mg.kg ⁻¹	200.0	210.0	290.0	280.0	3.4 to 2.5	9.5	7.32
Solvent Extractables	mg.kg ⁻¹	4295	3078	2226	1587	23.3 to 23.7		
Acenaphthene	mg.kg	0.10	0.13	0.06	0.05 <t< td=""><td>12.9 to 18.4</td><td></td><td>1</td></t<>	12.9 to 18.4		1
Acenaphthylene	mg.kg ⁻¹	0.13	0.12	0.20	0.17	6.1 to 11.5		
Anthracene	mg.kg ^{-t}	0.37	0.41	0.34	0.30	7.2 to 8.8		
Benz(a)anthracene	mg.kg ⁻¹	1.00	1.80	1.50	1.10	21.8 to 40.4		
Benzo(b)fluoranthene	mg.kg ⁻¹	1.50	2.30	2.70	1.80	28.2 to 29 8		
Benzo(k)fluoranthene	mg.kg ⁻¹	0.720	0.850	1.20	0.86	11.7 to 23.3		
Benzo(g,h,i)perylene	mg.kg ⁻¹	0.77	0.57	1.00	0.90	7.4 to 21 ₋ 1		
Benzo(a)pyrene	mg.kg ⁻¹	1.10	0.96	2.10	1.40	9.6 to 28.3		
Chrysene	mg.kg ⁻¹	1.40	1.80	2.20	1.60	17.7 to 22.3		
Dibenzo(a,h)anthracene	mg.kg ⁻¹	0.26	0.21	0.38	0.32	12.1 to 15.0		
Fluoranthene	mg.kg ⁻¹	2.50	3.10	3.00	2.40	15.2 to 15.7		
Fluorene	mg.kg ⁻¹	0.14	0.14	0.11	0.10	0.0 to 6.7		
Indeno(1,2,3-cd)pyrene	mg.kg ⁻¹	0.86	0.84	1.20	1.10	1.7 to 6.1		
Naphthalene	mg.kg ⁻¹	0.81	0.57	0.42	0.36	10.9 to 24.6		
Phenanthrene	mg.kg ⁻¹	1.30	1.30	1.00	0.91	0.0 to 6.7		
Рутепе	mg.kg ⁻¹	2.20	2.50	2.70	2.10	9.0 to 17.7		
D ₁₀ -Acenaphthene recovery	%	73	62	53	53			
D ₁₂ -Chrysene recovery	%	93	99	115	96	_	_	
D ₈ -Naphthalene recovery	%	36	44	20	20			
D ₁₂ -Perylene recovery	%	118	163	140	115		_	
D ₁₀ -Phenanthrene recovery	% .	90	90	74	72			

NOTES:

[&]quot;CV" = coefficient of variation calculated using CV = $[\sqrt{2(\text{max.-min.})/(\text{max.+min.})}]*100$

^{*} data from Sturgis (1987).

"<T" = a measurable trace amount; interpret with caution.

"<W" = no measurable response (zero); less than reported value.

[&]quot;--" not available or could not be calculated.

Table A-8. Sediment sample field replicates data.

			Station 172			Station 174		Variability (C	V), %	Lab. %
Parameter	Units	68228	68229	68230	68242	68243	68244	Field	Lab. *	Recovery *
2000-1000 μm	%	0.1	0.1	0.1	0.3	0.1	0.1	0.0 to 69.3		
999-62 μm	%	49.6	34.1	49.1	73.8	54.8	45.4	19.9 to 24.9	w-16	
<62 μm	%	48.6	63.6	50.6	25.8	41.2	52.7	15.0 to 33.8	***	
Moisture	%	57.0	67 0	59.0	57.0	61.0	61.0	3.9 to 8.7		
Field Density	g.cm ⁻³	1.321	1.226	1.302	1 347	1.291	1.317	2.1 to 3.9		
Faecal Coliforms	number.kg ⁻¹	<1000	<1000	~1000	~8000	10000	~30000	~43.3 to 76.0		
Escherichia coli	number.kg ⁻¹	<1000	<1000	<1000	~1000	-3000	<1000	~0.0 to 88.2		
Faecal Streptococcus	number.kg-1	<10000	<10000	<1000	<10000	<1000	<1000	-74.2 to 130		
Loss on Ignition	g.kg-l	47.0	81.0	48.0	62.0	76.0	77.0	11.7 to 33.0	7.1	
Total Organic Carbon	g kg ⁻¹	35.0	57.0	35.0	51.0	62.0	56.0	9.8 to 30.0	2.7	_
Total Kjeldahl Nitrogen	g.kg ⁻¹	1.90	2.70	1.80	0.82	1.10	0.80	18.5 to 23.1	4.9	
Total Phosphorus	g.kg ⁻¹	0.57	0.75	0.55	0.50	0.58	0.46	11.9 to 17.7	3.5	
Arsenic	g.kg	6.90	12.00	7.20	5.40	6.80	9.70	30.0 to 32.9	14.3	
	mg.kg ⁻¹	0.780	1.400	0.370	0.930	0.910	1.800			
Cyanide, avial	mg.kg ⁻¹							41.9 to 61.0	**	9.0
Cyanide, free	mg.kg ⁻¹	0.010 <w< td=""><td>0.019<t< td=""><td>0.010<w< td=""><td>0.019<t< td=""><td>0.019<t< td=""><td>0.020<t< td=""><td>3.0 to 173</td><td></td><td></td></t<></td></t<></td></t<></td></w<></td></t<></td></w<>	0.019 <t< td=""><td>0.010<w< td=""><td>0.019<t< td=""><td>0.019<t< td=""><td>0.020<t< td=""><td>3.0 to 173</td><td></td><td></td></t<></td></t<></td></t<></td></w<></td></t<>	0.010 <w< td=""><td>0.019<t< td=""><td>0.019<t< td=""><td>0.020<t< td=""><td>3.0 to 173</td><td></td><td></td></t<></td></t<></td></t<></td></w<>	0.019 <t< td=""><td>0.019<t< td=""><td>0.020<t< td=""><td>3.0 to 173</td><td></td><td></td></t<></td></t<></td></t<>	0.019 <t< td=""><td>0.020<t< td=""><td>3.0 to 173</td><td></td><td></td></t<></td></t<>	0.020 <t< td=""><td>3.0 to 173</td><td></td><td></td></t<>	3.0 to 173		
Cadmium	mg.kg ⁻¹	0.88	0.23 <t< td=""><td>0.70</td><td>0 67</td><td>0.67</td><td>0.84</td><td>13.5 to 55.6</td><td>6.5</td><td></td></t<>	0.70	0 67	0.67	0.84	13.5 to 55.6	6.5	
Chromium	mg.kg ⁻¹	72.0	16.0	49.0	69.0	89.0	73.0	13.7 to 61.6	11.6	
Copper	mg.kg ⁻¹	51.0	10.0	37.0	42.0	47.0	62.0	20.7 to 63.8	9.7	
Iron	mg.kg ⁻¹	40000	13000	25000	35000	43000	48000	15.6 to 52.0	4.7	
Lead	mg.kg ⁻¹	90.0	11.0	63.0	52.0	57.0	57.0	5.2 to 73.5	10.1	_
Magnesium	mg.kg 1	3000	8900	2200	2600	2700	2800	3.7 to 85.3		
Manganese	mg.kg ⁻¹	380	330	260	290	390	530	18.6 to 29.9		
Mercury	mg.kg ⁻¹	0.24	0.33	0.19	0.22	0.26	0.25	8.6 to 28.0	7.6	
Nickel	mg.kg ⁻¹	28.0	10.0	13.0	14.0	16.0	20.0	18.3 to 56.7	10.0	-
Zinc	mg.kg 1	290.0	50.0	190.0	130.0	170.0	230.0	28.5 to 68.2	9.7	
Solvent Extractables	mg.kg ⁻¹	3608	5131	2998	351	370	1489	28.1 to 88.5		
Acenaphthene	mg.kg ⁻¹	0.04 <t< td=""><td>0.04<t< td=""><td>0.04<t< td=""><td>0.05<t< td=""><td>0.06</td><td>0.05<t< td=""><td>0.0 to 10.8</td><td></td><td></td></t<></td></t<></td></t<></td></t<></td></t<>	0.04 <t< td=""><td>0.04<t< td=""><td>0.05<t< td=""><td>0.06</td><td>0.05<t< td=""><td>0.0 to 10.8</td><td></td><td></td></t<></td></t<></td></t<></td></t<>	0.04 <t< td=""><td>0.05<t< td=""><td>0.06</td><td>0.05<t< td=""><td>0.0 to 10.8</td><td></td><td></td></t<></td></t<></td></t<>	0.05 <t< td=""><td>0.06</td><td>0.05<t< td=""><td>0.0 to 10.8</td><td></td><td></td></t<></td></t<>	0.06	0.05 <t< td=""><td>0.0 to 10.8</td><td></td><td></td></t<>	0.0 to 10.8		
Acenaphthylene	mg.kg ⁻¹	0.06	0.11	0.07	0.10	0.19	0.18	31.5 to 33.1		
Anthracene	mg.kg 1	0.10	0.18	0.10	0.26	0.31	0.39	20.5 to 36.5		
Benz(a)anthracene	mg.kg ⁻¹	0.48	0.64	0.68	0.92	0.94	1.60	17.6 to 33.6		
Benzo(b)fluoranthene	mg.kg-1	1.00	1.00	1.80	1.20	1.40	3.30	36.5 to 58.9		
Benzo(k)fluoranthene	mg.kg ⁻¹	0.30	0.45	0.43	0.42	0.69	1.10	20.7 to 46.5		
Benzo(g,h,ı)perylene	mg_kg ⁻¹	0.27	0.57	0.23	0.35	0.74	0.82	39.5 to 52.1		
Benzo(a)pyrene	mg.kg-1	0.55	0.75	0.96	0.82	1.10	2.20	27.2 to 53.1		
Chrysene	mg.kg ⁻¹	0.80	0.91	1.20	1.00	1.30	2.30	21.3 to 44.4		
Dibenzo(a,h)anthracene	mg.kg ⁻¹	0.08	0.18	0.08	0.14	0.26	0.32	38.2 to 50.9		
Fluoranthene	mg.kg ⁻¹	1.10	1.80	1.20	1.80	2.10	2.90	25.1 to 27.7		
Fluorene	mg.kg ⁻¹	0.05	0.08	0.05	0.09	0.13	0.11	18.2 to 28.9		
			0.62				0.11			
Indeno(1,2,3-cd)pyrene Naphthalene	mg.kg ⁻¹	0.30 0.16	0.62	0.27 0.18	0.42 0.34	0.78 0.70	0.89	35.3 to 48.9 17.7 to 42.5		
	mg.kg ⁻¹					0.70				
Phenanthrene	mg.kg ⁻¹	0.39	0.68	0.40	0.75		1.00	14.6 to 33.6		
Pyrene	mg.kg ⁻¹	0.94	1.50	1.10	1.50	1.90	2.50	24.4 to 25.6		
D ₁₀ -Acenaphthene recovery	%	76	59	79	64	68	60			
D ₁₂ -Chrysene recovery	%	86	98	104	75	104	125			
D ₈ -Naphthalene recovery	%	42	26	45	38	28	17			
D ₁₂ -Perylene recovery	%	90	119	99	76	130	140			
D ₁₀ -Phenanthrene recovery	%	92	75	86	84	87	88			
	I]								

NOTES: "CV" = coefficient of variation [(Std_Dev./Mean)*100].

^{**} data from Sturgis (1987).

**\sqrt{T} = a measurable trace amount; interpret with caution.

**\sqrt{W}" = no measurable response (zero); less than reported value.

**-" not available or could not be calculated.

Sediment parameter correlation coefficients. Pearson Product-Moment analysis on $\log (x+1)$ -transformed concentration data; percentages were arc $\sin \sqrt{x}$ -transformed. Significant correlations at p < 0.05 are underlined (n = 16). Table A-9.

Anth	0.35	0.11	09'0	0.71	0.38	-0.26	0.45	0.72	69'0	0.80	0.71	0.71	0.83	Z9'0	0.81	0.33	0.56	79.0	0.74	-0.02	62.0	0.89	1.00	0.94	28.0	0.65	0.86	28.0	0.91	0.86	0.96	0.95	0.86	0.77	0.36	96.0	100
Acny	0.10	0.29	0.58	0.64	0.29	-0.24	0.44	0.63	0.75	0.85	0.72	0.78	0.80	0.74	0.78	0 47	0.65	0.69	0.77	-0.12	0.55	1.00	0.89	0.94	0.94	0.94	0.95	0.96	0.95	96 0	0.91	0.62	0.94	0.61	0.86	0.93	
Ace	0.38	0.11	0.56	0.63	0.20	-0.38	0.49	0.63	0.48	0.44	0.52	0.53	0.54	0 42	0.5Z	0.13	0 31	0.49	0.50	900	1.00	0.55	0.79	0.65	0.56	0.54	0.56	0.52	09.0	0.52	0.71	0.85	0.56	0.75	0.62	0.70	
SolExt	0.38	0 26	0.30	0.44	0.71	0.39	0 40	0.26	-0.13	-0.01	90.0	0.16	0.01	-0.05	-0 05	-0.04	0.19	-0.05	-0.00	1.00	90.0	-0.12	-0.02	-0.07	-0.05	-0 07	-0.04	-0.09	-0.04	-0.09	-0.03	0.13	-0.02	0 28	0.04	-0.05	
Zn	0.44	0 25	0.56	0.52	60.0	-0 44	0 49	0.56	0.36	0.92	0.93	0.78	0,93	0.98	0.92	69'0	0.63	0.94	1 00	-0.00	0.50	7270	0.74	0.62	<u>6Z'0</u>	0.81	0.80	0.81	0.81	0.80	0.80	0.59	0.79	0.42	0.77	0.62	
Ž	0.34	0.18	0.43	0.36	-0.05	-0.47	0.35	0.55	0.94	06.0	0.93	69.0	0.91	0.92	0.95	0.63	0.41	1.00	0.94	-0.05	0.49	69'0	79.0	0.73	0.70	0.73	0.71	0.72	0.72	0.70	0.71	0.52	0 70	0.39	0.68	0.73	
Hg	0.20	0.18	0 45	0.55	0.31	-0.02	0.52	0.45	0.50	0.56	0.52	0.60	0.55	0 65	0.47	0.15	1.00	0.41	0.63	0.19	0.31	0.65	0.58	79.0	0.70	69'0	07.0	69'0	69.0	0.71	0.63	0.54	0.71	0.31	09.0	0.64	
Mg	200	0.26	0.14	0.12	-0.14	-0.40	0.22	0.31	0.75	0.70	790	0.46	0.65	0.68	0.77	1.00	0.15	0.63	69.0	-0.04	0 13	0.47	0.33	0.50	0.55	0.56	0.53	75.0	0.54	0.49	0.45	0.18	0.51	0.12	0.34	0 48	
Mn	0:30	90:0	0.39	0.44	0.12	-0.38	0.32	0.59	0.00	0.93	0.88	0.68	0.97	0.86	1.00	7270	0.47	0.95	0.92	-0.05	0.5Z	0.78	0.81	0.63	0.79	0.80	67.0	0.62	0.62	0.78	0.83	0.67	0.78	0.54	0.80	0.84	
2	0 40	0 27	0.54	0.44	-0.01	-0.49	0.47	0.61	0.95	0 88	0.92	0.78	0.88	1.00	0.86	0.68	0.65	0.92	96.0	-0.05	0.42	0.74	79.0	7270	0.75	7270	77.0	0.78	7270	0.78	0.75	0.51	0.75	0.30	0.70	97.0	
Fe	0.38	0.03	0.45	0 49	0 25	-0.27	0.31	0.62	0.88	0.96	0.91	0.71	1 00	0.88	0.97	0.65	0.55	0.91	0.93	0 01	0.54	0.80	0.63	0.63	0.78	0.78	0.79	0.80	0.81	0.79	0.83	0.70	0.78	0.60	0.83	0.84	
CN	0 40	09.0	0.81	0.77	0.29	-0.36	0.71	0.85	0.75	0.69	0.84	1.00	0.71	0.78	0.68	0.46	09.0	69.0	0.78	0.16	0.53	0.78	0.71	7270	0.75	0.7Z	62.0	0.79	0.78	0.77	<u>0.78</u>	0.70	9Z'0	0.44	0.78	0.78	
Cu	0.43	0.28	0.62	0.52	0.15	-0.38	0.48	0.69	16.0	0.88	1.00	0.84	0.91	0.92	0 88	0.67	0.52	0.93	0.93	90.0	0.52	0.72	0.71	0.75	0.71	0.74	52.0	0.74	0.73	52.0	0.74	0.62	0.73	0 46	0.75	0.75	
Ç	0.24	0.10	0.44	0 47	0.25	-0.23	0 29	0.53	0.89	1.00	0 88	69.0	96.0	0.88	0.93	07.0	95.0	0.90	26.0	-0.01	0.44	0.65	0.80	0.84	0.82	0.63	0.84	0.65	0.84	0.84	0.81	9970	0 63	0.57	0.77	0.83	
Cd	0:30	0 28	0.52	0.44	-0.05	-0.53	0 45	0.61	1 00	0.89	0.91	0.75	0 88	0.95	0.30	0.Z5	0.50	0.94	96.0	-0.13	0.48	0.75	69.0	0.79	0.77	0.80	0.81	0.80	0.79	0.80	0.77	0.53	0.79	0.36	0.71	62.0	-
As	69.0	0.56	0.86	0.87	0.40	-0.36	0.81	1.00	0.61	0.53	69 0	0.85	0.62	0.61	65.0	0.31	0 45	0.55	99.0	0.26	0.63	0.63	0.72	0.74	69.0	79.0	0.68	69.0	0.73	0.65	0.81	0.73	0.66	0.50	0.62	6Z'0	
TKN	0.49	0.80	98 0	0.81	0.28	-0.31	1.00	0.81	0.45	0 29	0.48	0.71	0.31	0.47	0.32	0.22	0.52	0.35	0.49	0.40	0 49	0.44	0.45	0.56	0.5Z	0.60	0.60	0.56	0.5Z	0.56	0.5Z	0.50	09.0	0.27	0.55	0.56	
TP	-0 27	-0.37	-0.31	-0.05	0.62	1.00	-0.31	-0.36	-0.53	-0 23	-0.38	-0.36	-0 27	-0.49	-0.38	-0.40	-0.02	-0.47	-0.44	0.39	-0.38	-0.24	-0 56	-0.32	-0 29	-0.29	-0.27	-0.31	-0.31	-0.27	-0.37	-0.15	-0 24	0.12	-0.32	-0.37	0
тос	0.31	60.0	0 40	9970	1.00	0.62	0.28	0.40	-0.05	0.25	0.15	0.29	0 25	-0.01	0.12	-0.14	0.31	-0.02	60.0	0.71	0.20	0 29	0.38	0.28	0 27	0 24	0.27	0.24	0 29	0 24	0.31	0.51	0 28	0.62	0 38	0.29	000
LOI	0.55	0.58	0 88	1.00	99.0	-0.05	0.81	Z8 0	0.44	0.47	0.52	0.77	0.49	0.44	0.44	0.12	0.55	0.36	0.52	0.44	0.63	0.64	0.71	0.70	Z9 0	79.0	0.68	99.0	0.70	0.64	0.74	0.80	0.62	0.64	0.77	0.72	11
Moist	0.58	0.74	1.00	0.88	0.40	-0.31	0.86	0.86	0.52	0 44	0.62	0.81	0.45	0.54	0.39	0.14	0 45	0.43	0.56	0.30	0.56	0.56	09.0	0.62	0.59	0.62	0.63	0.60	0.61	0.62	0.65	99.0	0.62	0.45	0.68	0.64	0
Fines	0.24	1.00	0.74	0.58	60.0	-0.37	0.80	0.58	0 28	0.10	0.28	0.60	0.03	0.27	90 0	0.26	0.18	0.18	0.25	0.26	0.11	0.29	0.11	0 27	0.34	0.38	0.37	0.36	0.32	0.34	0.27	0.16	0.35	-0.04	0.20	0.27	000
Dist	1.00	0 24	0.58	0.55	0.31	-0.27	0.49	69.0	0.30	0 24	0.43	0.40	0.38	0.40	0.30	0.07	0.20	0.34	0.44	0.38	0.38	0.10	0.35	0.30	0.20	0.16	0.12	0.16	0.25	0.11	0.40	0.34	0.12	0 25	0.45	0.36	0,00
	Dist	Fines	Moist	F01	T0C	Τ	TKN	As	2	رد	đ	S	Fe	Pb	Mn	Mg	11g	ž	υZ	SolExt	Ace	Acny	\nth	BaAnth	BbFluo	BkFluo	BghiP	ВаР	Chry	DahAnth	Flan	Fino	IndP	Naph	Plien	Pyr	TDAILE

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Dist	0.30	0.20	0.16	0.12	0 16	0.25	0.11	0.40	0 34	0 12	0 25	0.45	0.36	0.40
Fines	0.27	0.34	0.38	0.37	0.36	0.32	0.34	0.27	0.16	0.35	-0.04	0.20	0.27	0.26
Moist	0.62	0.59	0.62	0.63	0.60	0.61	0.62	0.65	0.56	0.62	0 45	0.68	0.64	0.67
101	07.0	79'0	Z9 0	0.68	0.66	0.70	0.64	0.74	0.80	790	0.64	0.77	0.72	0.77
TOC	0 28	0.27	0.24	0.27	0.24	0.29	0 24	0.31	0.51	0.28	0.62	0.38	0.29	0.39
TP	-0.32	-0.29	-0 59	-0.27	-0.31	-0.31	-0.27	-0.37	-0.15	-0 24	0.12	-0.32	-0.37	-0 59
TKN	0.56	75.0	0.60	0.60	0.56	0.57	0.56	75.0	0.50	0.80	0 27	0.55	0.56	0.59
As	0.74	0.69	79'0	0.68	69 0	0.73	0.65	0.81	0.73	99 0	0.50	0.82	0.79	0.82
2	0.79	0.77	0.80	0.81	0.80	0.79	0.80	0.77	0.53	0.79	0.36	0.71	0.79	0.75
ڻ	0.84	0.82	0.83	0.84	0.85	0.84	0.84	0.81	0.86	0.83	0.57	0.77	0.83	0.82
ĵ	0.75	0.71	0.74	0.75	0.74	0.73	0.75	0.74	0.62	0.73	0 46	0.75	0.75	0.75
S	0.77	0.75	0.77	0.79	0.79	0.78	0.77	97.0	07.0	0.76	0.44	0.78	0.78	0.78
Fe	0.83	0.78	97.0	67.0	0.80	0.81	62.0	0.83	0.70	97.0	0.60	0.83	0.84	0.85
Pb	0.77	0.75	0.77	0.77	0.78	0.77	0.78	0.75	0.51	0.75	0.30	0.70	0.76	0.73
Mn	0.83	0.79	0.80	0.79	0.82	0.82	0.78	0.83	79.0	0.78	0.54	0.80	0.84	0.83
Mg	0.50	0.55	0.56	0.53	75.0	0.54	0.49	0.45	0.18	0.51	0 12	0 34	0 48	0 44
Hg	Z9 0	0.70	0.69	0.70	69 0	69.0	0.71	0.63	0.54	0.71	0.31	09.0	0 64	90
Z	0.73	0.70	0 73	0.71	0.72	0.72	0.70	0.71	0.52	0.70	0.39	0.68	0.73	0.70
Zn	0.82	0.79	0.81	0.80	0.81	0.81	0.80	0.80	0.59	0.79	0 42	0.77	0.82	0.8
Sofext	-0.07	-0.05	-0.07	-0 04	60 0-	-0.04	60.0	-0.03	0.13	-0.05	0 28	0.04	-0.05	0 04
Ace	0 65	0.56	0.54	0.56	0.52	0.60	0.52	0.71	0.85	0.56	0.75	0.82	0.70	0.72
Acny	0.94	0 94	0.94	0.95	96.0	0.95	0.96	0.91	0.82	0 94	0.61	0.86	0.93	6.0
Anth	0.94	0.87	0.85	0.86	0.8Z	0.91	0.86	96 0	0.95	0.86	0.77	0.98	96 0	0.9Z
BaAnth	1 00	0.98	76.0	96.0	76.0	0.99	0.95	0.98	0.85	0.96	0.58	0.94	0.99	0.97
BbFluo	0.98	1.00	0.98	76.0	0.99	0.99	960	0.95	97.0	76.0	0.54	78.0	960	0.94
BkFluo	Z6-0	0.98	1.00	0.99	0.99	0.98	0.98	0.92	0.76	0.99	0 49	0.85	0 94	0.0
BghiP	96.0	76 ⁻ 0	0.99	1.00	0.99	Z6.0	0.99	0.92	0.78	1.00	0.55	0.86	0.93	0.92
BaP	76'0	0.99	0.99	0.99	1.00	0.99	0.98	0.94	0.77	0.96	0.52	0.86	0.95	6.0
Chry	0 39	0.99	0.98	Z6 0	66 0	1.00	96 0	76.0	0.82	76.0	0.56	160	0.98	60
DahAnth	0.95	96.0	0.99	0 99	0.98	0.96	1.00	0.91	97.0	0.99	0.51	0.84	0.92	0.90
Flan	0.99	0,95	0.92	0.92	0.94	Z6.0	0.91	1.00	0.89	0.91	0 63	76.0	1 00	0.99
Fluo	0.85	0.78	0.76	0.78	0.77	0.82	9Z'0	0.89	1.00	97.0	0.85	0.95	0.88	0.91
IndP	0.96	76.0	0.99	1.00	0.99	76.0	66.0	0.91	0.78	1.00	0.55	0.85	0.93	0.91
Naph	0.59	0.54	0.49	0.55	0.52	0.56	0.51	0.63	0.85	0.55	1.00	0.75	0 62	0.70
Phen	0.94	0.87	0.85	0.86	0.86	0.91	0.84	Z6.0	0.95	0.85	0.75	1.00	0.96	0.98
Pyr	0.99	960	0.94	0.93	0.95	0.98	0.92	1.00	0.88	0.93	0.62	0.96	1 00	0.99
TDARL	1													



